Gas Journal

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Editorial Notes

Oil from Coal

At the Conservative Conference at Scarborough last week a resolution was carried urging the Government, as a matter of national necessity, to increase their efforts in the direction of actual production of oil from coal. Moving the resolution, Captain Paton Reid pointed to the extremely small proportion of home produced oil in relation to the total consumption, and drew a comparison between this country and Germany, where at the moment half that country's oil requirements are being met by production from coal. Admitting the expense of the process, Captain Reid maintained that the problem is so urgent that money for the purpose should be set aside as a major defence item in the rearmament Budget. Seconding the resolution, Mr. A. K. Charlesworth said that every delay in developing and assisting the progress made Great Britain drop farther behind in the vital race, and he urged the Government to appoint some organization specifically to deal with the problem and to concentrate on research. When satisfaction was reached on the technical and economic possibilities of any process, then the Government should make capital grants towards the erection of plants. In the meantime, if the Falmouth Committee could issue an interim report it would do a great deal to allay public anxiety.

The Government's policy on this problem of national concern was outlined by Captain Crookshank, Parliamentary Secretary to the Mines Department. He observed that in dealing with the subject the Government had always in view the two objects of increasing employment and improving national defence, but however desirable those objects might be they must have some regard to the cost and the economics of their policy. That oil could be made from coal was technically established, he remarked. It was equally well established that bananas could be grown in greenhouses. It was because of the vital importance of the oil problem in a time of emergency and because of the different and difficult commercial and technical considerations involved that the Government had set up the Committee under the Chairmanship of Lord Falmouth. He had reason to hope that the report of this Committee, which had been asked to balance the advantages and disadvantages of producing oil from coal, would not be long delayed. He emphasized the impartial nature of the Committee, " because the matter had become very largely a political one."

Being so closely concerned with this problem of home oil production and the substitution of imported oil by fuels other than oil, the Gas Industry naturally eagerly awaits the publication of the report of the Falmouth Committee, and will have noted with satisfaction Captain Crookshank's hint as to its issue in the not distant future. Our Industry has a long and vast experience of the treatment of raw coal for the production of solid, liquid, and gaseous fuels; and this knowledge is bound to be of the utmost service to the nation in any plans for making the country less dependent on imported oil. To-day only about 7% of the total light oils consumed is home produced, but of this 7% the carbonizing industries account for two-thirds, the remainder being made by the hydrogenation process. But the possibilities of replacing oil by the products of carbonization of coal are enormous. Given encouragement, developments in the application of compressed coal gas, possibly enriched, would be accelerated. In another direction, the preparation of reactive cokes for use in producer-gas driven motor lorries, work could proceed on a more ambitious scale, and, we think, with far reaching results. Oil production by the carbonizing industries could be increased and the question regarded from a changed angle. The remarkable flexibility which characterizes the Gas Industry's process allows of three methods of attacking the problem of replacing imported oil. Replacement can be effected not only by home produced oil but also by home produced gaseous and solid fuels. Greater weight should be given to the potentialities of the Gas Industry than is generally given. It has a flexible process, and a personnel specifically trained to develop this flexibility to the best advantage. The nation has in the Gas Industry an asset the worth of which merits greater recognition and the closest consideration in any long-term fuel policy.

Public Lighting

In the "Journal" last week we gave an account of a Ministry of Health Enquiry into an application of the Gloucester Corporation to borrow £16,000 for the purposes of public lighting. The application was concerned with the proposal of the City Council to substitute electricity for gas in those streets at present lighted by gas. The Town Clerk said that the Council was convinced that electricity was a better form of lighting than gas for streets, and that the policy of the Corporation for a great many years had been to eliminate gas for street lighting. The Corporation, he added, had their own electricity undertaking, and the matter was always in their own hands. Surely, however, the Council has a responsibility for the spending of ratepayers' money which should involve discussion of the important question of street lighting with an open mind, and any decision regarding which illuminant, gas or electricity, to employ should be based on the merits of the two in relation to cost and the conditions to be fulfilled, and not on blind prejudice.

As large ratepayers the Gloucester Gas Light Company rightly opposed the Corporation's application, and the enquiry reported in our columns last week brought to light a state of affairs not uncommon where local authorities own the electricity undertaking and where the gas undertaking is company-owned. The Highways and Works Committee, explained the Town Clerk, had always been advised that from the point of view of lighting value electricity was twice as efficient as gas. A visit of members of the Committee to Folkestone last month during the conference of the Association of Public Lighting Engineers would, we suggest, have caused them to think twice about this advice. During the course of the enquiry the City Engineer and Surveyor spoke of an interview with the Distribution Manager of the Gas Company, when a better system of lighting was mentioned, and agreed that he told the latter that he thought no useful purpose would be served by the submission by the Gas Company of an application, because the Committee had decided on their policy. He agreed, too, that the comparative figures laid before the Highways Committee were made up from an out-of-date gas lighting system and up-to-date electric lighting. This, presumably, is Gloucester Corporation's interpretation of a fair field and no favour.

As we have pointed out, Gloucester Corporation own their electricity undertaking. In the areas of local authorities where electricity and gas are supplied by competing companies there is more likelihood of gas and electricity being judged on their merits. Even in these cases, however, the bias towards electricity is all too frequently to be observed. This bias is not because of any superiority possessed by electricity over gas for public lighting, but is the result of a woeful ignorance of what gas can accomplish in this field, and the idea held by many that gas is a back number. Here again in all too many instances the comparison is between old-fashioned gas installations and modern electrical equipment. It is most important that the local authorities and the public generally should be made fully aware of the progress of gas—that the public should be gas-minded. In this connection we have emphasized many times in these columns that every member of the personnel of a gas undertaking should regard it as part of his daily work to impress on the minds of the public with whom he comes into contact that gas is in every way modern; and we are glad to note that at the annual meeting of the Gloucester Gas Company's Profit-sharing and Savings Scheme, held subsequently to the Ministry of Health Enquiry regarding the city's public lighting, Mr. J. H. Jones, a Director of the Company, who presided, urged everyone in the Company to exert his influence in the cause of gas. A great deal more could be done generally in this direction than is being done at present. The need for such effort was exemplified by the voting of the Council of a large town, served by company-owned gas and electricity undertakings, on a recommendation of the Lighting Committee that a ten-year contract should be entered into with the gas company for street lighting. The Committee had gone thoroughly, from the economic and technical points of view, into the relative merits of lighting the town by gas or by electricity, and had arrived at a decision in favour of gas. When it came to the voting at the Town Council meeting, 22 were in support of the Committee's recommendation, and 19 against. Twelve members—all men—of the Council refrained from voting, while all the seven women councillors voted solid for electricity, against the recommendation of their own Committee.

Planned Selling

It is being increasingly recognized that selling is a science, that any sales campaign, to be effective, must be planned with as great a measure of precision as can be attained. Such planning in itself costs money and it necessitates an accurate knowledge of the demands of the consumer in relation to his spending power and the attractions of competing interests. Sales policies in the Gas Industry are still far too haphazard; all too frequently procedure is on no definite plan. In emphasizing the need for planning, and in offering constructive suggestions on how to set about this planning, Colonel W. M. Carr did good service to the Gas Industry at the recent Conference of the British Commercial Gas Association. How many times we find sales campaigns optimistically launched, and at much expense, without any considerable prior thought to the reactions of the consumer to the sales push, to the capacity of his pocket, or to the incidence of competition. Selling in the dark is a costly business and wasteful of effort which should be properly directed. The action of the Ministry of Health in arranging for the taking of a family budget census, to provide information as to how the incomes of the less well-to-do families are apportioned, is of the utmost interest to the Gas Industry, for this information will not only show what amount is expended on gas, on electricity, and on other fuels, but will provide a means of ascertaining what our Industry can reasonably expect to achieve among this group of consumers and how best to approach the problem.

An aspect of selling which until comparatively recently has not received nearly enough attention is that of regional and even nation-wide selling in the Gas Industry. It is a matter to which we have referred constantly in these columns, pointing to the added strength and effectiveness of co-operative effort. The views we have expressed received endorsement in plenty during the discussion on Colonel Carr's Paper at the B.C.G.A. Conference. The London Group was the pioneer in group marketing, and Mr. R. W. Lowman, Sales Manager to the Gas Light and Coke Company, spoke of the happy experience of this group. There are times, he explained, when individual policies do not allow of taking the fullest part in a particular marketing scheme, but one thing has been clearly proved—that the results which can be achieved as a body can never be equalled by the total of the results obtained individually. This is an accepted fact, and it is not difficult to devise ways and means of

making the group planning flexible, of a character such that all members can participate in the general effort. The Gas Light and Coke Company have found that for the same expenditure they can achieve much better results as constituent members of the group than they can by themselves.

The public is mobile these days, and this makes repetition of the same appeal all the more effective. The same series of Press advertisements, the same posters, and where possible the same price appeal, produce results over an area which could never be equalled if five or six different advertisements, five or six different stories, were being used locally. Though much more remains to be done, it is gratifying to note the growing belief in regional marketing. Indicative of an even wider conception is the gas fire campaign publicity at the moment appearing throughout the country. This publicity material, for which the B.C.G.A. is responsible, advertises a nation-wide price offer for the purchase of gas fires; it is a step towards a more unified marketing policy, at which we should all aim.

The Open Hearth

WHILE admitting that the elimination of smoke from our atmosphere is a matter of national importance, Lord Horder, in an Address on "Health and the Hearth" at the National Coal Convention at Harrogate last week, suggested that we may purchase much too dearly the superior convenience "at present" of gas and electricity. As an ardent advocate of the open fireplace, he urged investigation into the arrangements for retailing, delivering, storing, and handling coal-fuel, and for disposing of ashes. "The open fireplace," he said, "has been associated for centuries with our ideas of comfort, and I do not wish to see the British home deprived of its cheerful, healthy influence." Surely, however, Lord Horder cannot associate the smoke produced by burning raw coal in the open firegrate with cheerfulness and health. The logical way to health and comfort lies in the use of smokeless fuels, and as regards the open firegrate these fuels are at hand, though at present not in adequate quantity. Their substitution for raw coal should be pressed forward with greater vigour. Investigation into the more efficient use of raw coal in the open firegrate could in any event result only in a compromise, whereas the burning of smokeless fuels would provide a practical solution and the benefit would be immediate.

Lord Horder spoke of the stuffiness of rooms heated by methods other than the open firegrate. How, though, can a room be stuffy if warmed by a properly flued gas fire which affords adequate ventilation while at the same time serving as a source of cheerful radiant heat? And what exactly does Lord Horder imply by his assertion that we may pay too dearly for the convenience of gas? Given a satisfactory measure of ventilation, there can be no argument against gas on the score of health; and if he is thinking in terms of money, then it can be proved beyond any doubt that for intermittent heating gas is more economical than coal. The health aspect of the burning of any fuel is, of course, bound up with the question of adequate ventilation; but adequate ventilation does not mean excessive air change, and there is plenty of evidence to show that the ventilating effect of a properly flued gas fire is perfectly satisfactory from the health point of view.

The fuel costs of a smokeless house need be no greater than those of a house in which raw coal is burned, and the advantages in cleanliness, convenience, and comfort do not need stressing here. Much more must be done, however, to encourage the installation of coke burning grates, and in supplying smokeless fuels satisfactory for use in existing grates. This matter was discussed at the Conference of the National Smoke Abatement Society this month. Dr. W. M. Frazer, Medical Officer of Health at Liverpool, pointed out that the authorities of the large towns are becoming such large landlords that the solution of the smoke problem will be to a great extent in their hands. Yet "it is to be regretted that up to the present full advantage has not been taken when making plans for the erection of corporation houses. Housing committees should consider the smokeless alternatives to the ordinary bituminous coal-burning firegrate. It would be an economic reform to make compulsory the installation of grates that are capable of burning coke as well as coal." Dr. Frazer also joins with us in the suggestion that much can be done to reduce the smoke evil by teaching school children to regard coal as a raw material, and pointing out to them the destruction and, above all, the ill effects produced on health caused by regarding coal as a finished product. At the same Conference Dr. J. J. Jervis, Medical Officer of Health at Leeds, spoke of the work done in the West Riding of Yorkshire in exhorting housing authorities to install grates capable of burning high temperature coke, and of the co-operation of gas undertakings with the Regional Smoke Abatement Committee in this regard. We look forward to still closer co-operation between our Industry and the National Smoke Abatement Society with the aim of easing the domestic burdens and bettering the health of the community by the greater employment of smokeless fuels.

In This Week's "JOURNAL"

Carbonization of Cannel.

At the June Meeting of The Institution of Gas Engineers in 1936, Mr. James Jamieson, of Edinburgh, and Dr. J. G. King, of the Fuel Research Board, described the results obtained at the Granton Works of the Edinburgh Corporation Gas Department by the carbonization of a Scottish cannel in continuous vertical retorts under conditions of gas manufacture. These results showed that cannel, if available in sufficient quantity and of a quality equal to that investigated, offered considerable promise as a source of smokeless fuel, cheap gaseous therms and a high yield of a tar which was a potential source of motor spirit and fuel oil. An investigation is now recorded by the same Authors giving details of the yields obtainable from the same cannel under the conditions of low-temperature carbonization. This parallel investigation provides an interesting comparison of the two systems of carbonization and of the properties of the corresponding products. The results show that carbonization under gas-making conditions compares favourably with low-temperature carbonization in the following respects: The yield of gas by the latter process is much less, although its calorific value is higher; the yield of tar by the latter process is a few gallons less, and is not greatly superior to the high-temperature cannel tar for the purpose of hydrogenation; the combustibility of the low-temperature coke is only slightly higher. This comparison provides an additional reason for a national assessment of the quantities available in different districts of cannels of sufficiently high quality for gasification purposes.

See p. 157.

Reminiscences of a Gas Examiner.

In his Presidential Address to the North of England Gas Managers' Association, Dr. J. T. Dunn traces the legislation governing the permissible quantity of sulphur compounds in town gas. He refers particularly to the gas supplied by the Newcastle Company, mentioning that the average content in 1929-30 was 10·9 grains per 100 cu.ft., while for the year 1936-37 (July to July) the figure was 6·7 grains per 100 cu.ft. He concludes by remarking that, even though restriction and supervision may have hampered the Industry, it has triumphed over them, and now presents the spectacle of an organized Industry, second to none in the benefits it confers on the community, and an example to others in its efficiency and its enterprise.

See p. 162.

Personal

We have been pleased to receive a visit this week from Mr. FRANK AYRE, Manager of the West Footscray (Melbourne) Works of the Parkinson Stove Company (Australia), Ltd., who recently arrived in England on a combined business and holiday visit.

Mr. Ayre went to Australia in 1927 when the Parkinson Stove Works were established there. He returned to England for a visit in 1932. The Works at Footscray are entirely self-contained and have made great strides since they were established. The manufactures include gas cookers, grillers, fires, and heavy duty appliances, also fuel stoves and grates. Water heaters are handled by the Subsidiary Company, Hugh Harford, Ltd. Prior to joining the Parkinson Stove Company, Mr. Ayre, it will be remembered, was associated with the Birmingham Gas Department, and he was Honorary Secretary of the first Salesmen's Circle formed by the B.C.G.A. He is a Director of the Melbourne Rotary Club, and shortly before leaving, he broadcast a talk on the manufacture of gas appliances.

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The autumn number of the Birmingham Gas Department's Magazine refers to the recent retirement, after 44 years' service in the Gas Industry, of Mr. WILLIAM C. PINKNEY, Engineer-in-charge of the Saltley Works. After an early training with the Liverpool Gas Company, Mr. Pinkney occupied various appointments in Northern Ireland until going to Birmingham in 1911 as Supervising Foreman at the Nechells Works. In 1927 he was transferred to Saltley as Assistant Engineer, being put in charge of the Swan Village Works four years later. He has been Engineer at Saltley since 1932. To mark his retirement, Mr. Pinkney was made the recipient of a presentation, on behalf of his colleagues, of a silver cigarette casket suitably inscribed, together with a diamond and sapphire ring for his wife. The presentation was made by Mr. A. W. Smith (General Manager and Secretary), whose complimentary references to Mr. Pinkney's work for the Department were endorsed by Mr. G. C. Pearson (Engineer-in-Chief).

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Mr. S. H. STOKES, Technical Assistant to the Buxton Corporation Gas Department, has been appointed Assistant Engineer to the Elland-cum-Greetland Gas Company.

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The Stockport Gas Department has appointed Mr. W. ELLIOTT, of the Elland-cum-Greetland Gas Company, to the position of Assistant Engineer and Manager in succession to Mr. R. L. Greaves, who, as already announced in the "JOURNAL," has been appointed Engineer and Manager at St. Helens.

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After twenty years as Engineer and Manager of the Alyth Gas Light Company, Mr. ARCHIBALD D. COUBROUGH intimated his intention of resigning at last week's meeting of the Directors of the Company.

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Mr. and Mrs. J. G. CLARK, of "The Spinney," Brothertoft Road, Boston, have recently celebrated their golden wedding anniversary. Mr. Clark is a Director of the Boston Gas Light and Coke Company.

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Mr. J. K. MITCHELL, B.Sc. (Eng.), Assistant Engineer and Manager of the Brighouse Gas Department, has been appointed Deputy Engineer and Manager to the Dudley, Brierley Hill, and District Gas Company. He will take up his duties in November. Another member of the staff of the Brighouse Gas Department, Mr. M. HAMSHAW, Junior Chemist, has been awarded a West Riding Scholarship tenable at the University of Leeds, where he will take the Degree Course in Gas Engineering.

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On the expiration of his tenure of the Gas Light and Coke Company's Gas Research Fellowship at the Imperial College of Science and Technology on Sept. 30, Mr. M. MACCORMAC, B.Sc. (Lond.), A.R.C.S., D.I.C., was appointed to the Fellowship for a further year.

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Mr. J. WILSON, who has been Secretary to the Huntly Gas Company for thirty-seven years, has been presented with an inscribed silver salver by the Directors.

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Mr. B. LONG, previously General Manager and Secretary of the Horley District Gas Company, has relinquished the secretarial side of his duties upon his election to the Board of Directors. Mr. H. HUGGETT has been appointed Secretary of the Company.

At a gathering on Oct. 1, the staff and employees of the Motherwell Gas Department made presentations to Mr. JOHNSTONE, retiring foreman, and to Mr. GARDNER, technical assistant, and Mrs. Gardner, a late employee of the Department, on the occasion of their marriage. The chair was taken by Mr. William Kirk, Assistant Engineer and Manager, the presentations being made by Mr. A. McDonald, Engineer and Manager.

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Councillor REGINALD JOHN REW has consented to nomination as Mayor of the City of Exeter for the ensuing year. Councillor Rew is well known to the Gas Industry; for the past thirty years he has held a responsible position on the commercial side of Messrs. Willey & Co., Ltd., and is also Managing Director of the Devon Gas Association. He is a Freeman of the City, a past-Sheriff, and one of the representatives of Polsloe Ward on the City Council.

Obituary

Mr. ANDREW HOGG, who was Chairman of the Leven Gas Company when it was acquired by Buckhaven Town Council, died on Sept. 25, at the age of eighty-five.

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The sympathy of his many friends in the Industry will be extended to Mr. H. J. TOOGOOD on the death of his wife, which occurred on Oct. 7 at the age of 58. The cremation service took place at Woking on Tuesday, and the ashes are to be interred in her native town of Derby.

Forthcoming Engagements

Oct.

14.—EASTERN COUNTIES ASSOCIATION.—Autumn Meeting at Bedford.

16.—WESTERN JUNIORS.—Meeting at Stroud. Paper by Mr. W. Barber.

16.—YORKSHIRE JUNIORS.—Annual General Meeting at Leeds.

19.—I.G.E.—Gas Education Executive Committee, 11 a.m.; Gas Education Committee, 2.30 p.m.

19.—LONDON AND SOUTHERN JUNIORS.—Opening Meeting and Presidential Address of R. N. LeFevre.

19.—B.G.F.—Exhibitions Committee, 11 a.m.

20.—B.C.G.A.—Southern District Conference at Swindon.

21.—MIDLAND JUNIORS.—Meeting and Paper by F. J. Bengough on "Purging of Water-Sealed Gasholders."

23.—SCOTTISH WESTERN JUNIORS.—Visit to Paisley Gas-Works.

23.—LONDON AND SOUTHERN JUNIORS.—Visit to Wandsworth Works of Vacuum Oil Company.

25.—LONDON AND COUNTIES COKE ASSOCIATION.—Executive Committee, 11 a.m., and Central Committee, 12 noon, at Gas Industry House. Luncheon, 1.15 p.m., and Annual General Meeting, 3 p.m., at the Mayfair Hotel, Berkeley Street.

26.—B.C.G.A.—Eastern District Conference at Lincoln.

27.—B.C.G.A.—Northern District Conference at Darlington.

28.—COKE OVEN MANAGERS' ASSOCIATION.—Annual Dinner, Hotel Victoria, London.

Nov.

2.—I.G.E.—Council, 9.30 a.m.; Council (*continued*), 4.30 p.m.

2 and 3.—I.G.E.—Autumn Research Meeting.

3.—BRITISH GAS FEDERATION.—Annual General Meeting and Dinner, Grosvenor House, Park Lane, W. 1.

3.—SCOTTISH WESTERN JUNIORS.—Visit to India Tyre Company, Ltd., Inchinnan.

4.—S.B.G.I.—Autumn Meeting, May Fair Hotel. Council, 11 a.m.

4.—MIDLAND JUNIORS.—Visit to Fuel Research Station, East Greenwich.

6.—SCOTTISH EASTERN JUNIORS.—Short-Paper Day at Edinburgh.

10.—SOUTHERN ASSOCIATION (EASTERN DISTRICT).—Meeting at Gas Industry House, 2.30 p.m. Discussion on "The Importance of Coke Service."

13.—SCOTTISH WESTERN JUNIORS.—Meeting and Paper by D. S. Davies on "Gas as Applied to the Textile Industry."

News in Brief

CURRENT EVENTS IN THE GAS INDUSTRY

The Index for the quarter July-September, 1937, appears as a supplement with this issue of the "JOURNAL."

Liverpool's Building Trades Exhibition will be held at Renshaw Hall from Oct. 13 to 23.

A **Contribution** of £100 to the Edinburgh Royal Infirmary Extension Fund has been made by Messrs. Alder & Mackay, Ltd.

Gas Cookery Demonstrations are now being given every Tuesday at the showrooms of the Folkestone Gas and Coke Company.

For New Vertical Retorts, the Lymm Urban Council Gas Department propose to accept the tender of Messrs. Drakes, Ltd., Halifax.

New Railway Wagons of the Stalybridge Gas Department bear a representation of the genial figure of Mr. Therm with the slogan "Mr. Therm—Always at Your Service."

A Declaration of Calorific Value by the Iron Bridge and District Gas Company, Ltd., states that on and after Jan. 1, 1938, the Company will supply a gas of 450 B.Th.U. per cu.ft.

The First of a Series of Lectures to be given to employees of the Edinburgh Gas Department this winter was delivered last week by Mr. D. Melvin, Assistant Engineer and Manager, in the Public Hall, Broughton Street.

At the Annual Conference of the Institute of Vitreous Enamellers held in Birmingham last week, Sir Harold Hartley, C.B.E., was elected President. Mr. W. Todd, of the Parkinson Stove Company, Ltd., was re-elected to the Council.

Expenditure on Public Lighting, states the Manchester Corporation Highways Committee in its report on the past year, was £115,418 on gas and £71,284 on electricity. The number of gas lamps is 21,014 and electricity is responsible for 9,413.

The Tender of Messrs. Robert Dempster & Sons, Ltd., of Elland, for supply and erection of coke handling and storage plant has been accepted by the Sowerby Bridge U.D.C., subject to the Minister of Health granting borrowing powers to the extent of £3,600.

New Showrooms are shortly to be opened by the Nottingham Gas Department in Beeston Square. The showrooms will cater more particularly for residents in outlying districts, and if the scheme is a success it is intended to open additional showrooms in other districts.

A Decision to Oppose the suggestion of the Sub-Committee appointed to consider the Ashby-de-la-Zouch Gas Order, 1937, to charge 1s. a therm for gas in the urban district and 1s. 3d. a therm in the rural district, was made at a recent meeting of the Ashby Rural District Council.

The Payment of a Final Dividend of 4½%, free of income-tax and payable on Nov. 19, making 8%, free of income-tax, for the year ended June 30, has been recommended by the Directors of the Oriental Gas Company. The Annual Meeting of the Company will be held on Nov. 18.

An Exhibition of gas appliances and practical cookery demonstrations in the Town Hall Crypt, Middlesbrough, were held by the Gas Department from Sept. 20 to 24. The exhibition was opened by Alderman S. A. Sadler, J.P., Chairman of the Gas Committee, and the demonstrations were given twice daily by Miss N. Longworth.

Copies of the following recently issued British Standard Specification may be obtained, price 3s. 6d. each, from the Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, S.W. 1: No. 753-1937.—Density-composition tables for aqueous solutions of sulphuric acid for use in conjunction with British standard density hydrometers.

Among the Contracts Approved by the Birmingham City Council at their meeting this week were: West's Gas Improvement Company, Ltd., Manchester, for the manufacture, supply, and delivery of one tray feeder conveyor at Nechells Gas-Works, and Messrs. W. C. Holmes & Co., Ltd., Huddersfield, for the manufacture, supply, and installation of one B.M. meter at Adderley Street Gas-Works.

In the Window Dressing Competition organized during the City's Shopping Week, the Plymouth and Stonehouse Gas Light and Coke Company took a first and second prize. The first of these displays was a fireside scene decorated with pictures of Mr. Therm performing his multifarious tasks in the home, and the other display was a show of cookers with Mr. Therm in painter's overalls advocating brighter kitchens.

A Record Day's Business marked the opening of an exhibition held by the Tunbridge Wells Gas Company for the fortnight from Oct. 1. The exhibition includes displays of gas appliances of all types. In connection with it, a "Mr. Therm's Club" for children has been inaugurated, and over 800 members were enrolled during the first five days. Cash prizes are offered to children for the best essay on "What a Therm of Gas will Do."

Practical Cookery Demonstrations in connection with Rotherham's gas cooker month were given each day in the Chantry Studios, Corporation Street, at 3 p.m. and 7 p.m. from Oct. 4 to 8. The cookery demonstrations were given by Miss G. Hocken, of the Radiation Research Kitchen, who used a "Regulo" controlled "New World" cooker. Special chocolate cookery demonstrations were given by Miss M. Cox, of Cadbury Brothers, Ltd. An attractive invitation was sent out to consumers.

Recent Redistribution of Administrative Areas in the West Riding of Yorkshire brought Burley-in-Wharfedale into Ilkley. Burley continues to be in the Otley Gas Company's supply area but the distribution of the Otley gas in Burley is now undertaken by Ilkley U.D.C. Gas Department. The October meeting of the Ilkley Council approved substantial reduction in gas charges at Burley and an attractive exhibition of domestic appliances was staged recently by the Ilkley Department at the Burley Lecture Hall.

Classes for Domestic Servants on the use, care, and maintenance of domestic electric appliances were inaugurated at a meeting on Oct. 4, at the showrooms of London Associated Electricity Undertakings, Ltd., Earl's Court Road, London, S.W., called by the Electrical Association for Women. Miss Caroline Haslett, who was in the chair, said that these classes, which aimed at the removal of any fears or prejudices which maids might have about the use of electrical appliances, were free, and if the maids passed a small examination at the end of the course, they would receive a certificate of proficiency.

At the Horse Parade at the Warwickshire Agricultural Show, it was stated by the Chairman, Alderman Harold Mason, M.B., J.P., at the annual meeting of the Leamington Priors Gas Company on Sept. 28, the Company's horses had been awarded first, second, and fourth prizes. In a recent letter to the local Press a South American visitor stated that he was so impressed by the condition of a pair of horses drawing a load of coal that he complimented the driver, enquiring to whom they belonged. He remarked they were what he pictured England had in the good old days. The horses were the Gas Company's, and everyone would agree that the drivers and horse-keeper were to be congratulated on the manner in which they kept their charges.

Reductions in the Price of Gas following a most successful year's working were announced by Hereford City Council at their meeting last week. Mr. F. Cuddon, Chairman of the Gas Committee, stated that the sales of gas in the city had increased during the year by 20 million cu.ft. This was an increase of 8·3%, and was the largest increase for ten years. The Committee, said Mr. Cuddon, had decided that ordinary consumers should receive a discount of 7½% against 5% as at present. They had also devised a scale of rebates. The rebate system would now begin at a figure over 50,000 cu.ft. per annum instead of 200,000 cu.ft. as at present. There would be a rebate at the end of the year of ½d. per therm for consumers of 50,000-100,000 cu.ft.; 1d. per therm for consumers of from 100,000-200,000 cu.ft.; and so on up to 4d. rebate per therm for people consuming 3 million to 6 million cu.ft. Mr. Cuddon added that the discount for slot consumers would be increased from 1s. 3d. to 1s. 5d. The Committee's report was adopted, and Mr. Cuddon and the Engineer and General Manager, Mr. A. Roberts, were congratulated on their work during the year.

Fine New Showrooms

An Exterior View.

Opened at Crouch End

Hornsey Company's Enterprise

Erected on one of the finest sites in the district, the opening of splendid new showrooms for the Hornsey Gas Company was marked last Thursday by an informal luncheon given by the Chairman and Directors at the new premises at Crouch End Broadway, N. 8.

Hornsey gas consumers may well be proud of the fine new showrooms which have been built to serve them at Crouch End Broadway. Occupying a prominent site adjacent to the new Council Offices, the building is a landmark in the district, superseding as it does the Company's original premises not far away.

The exterior, as will be seen from the accompanying photograph, is of a very striking design, with sculptured plaques illustrating various phases of the Gas Industry's activities, while an unusually large amount of window space, on both the Broadway and the forecourt in front of the Town Hall, give excellent scope for a variety of individual displays and also " open " views into the interior. For the latter purpose non-reflecting windows have been adopted to good advantage. Interior floodlighting lamps arranged above each window serve to illuminate the displays after dark.

The showroom itself is divided up into sections devoted to the various domestic applications of gas. On entering through the main doorway, one finds oneself in a commodious reception hall, around which is arranged a representative display of appliances, particularly attractive being the beautiful gas fire settings in various appropriate surrounds. Stretching away to the left, as one enters, is a pleasing corridor, with the showroom windows on the left and various individual displays in recesses on the right. Among the latter are a gas fire section, in which a wide variety of pleasing designs of fire, in different coloured finishes, is arranged in tiers, with a coke fire burning cheerfully at the back, a cooker section, and, at the far end, a comprehensive water heating display, where many different types of apparatus are fitted up in working order, with dial thermometers above the baths to indicate the discharge temperature of the water. Particularly pleasing is the decoration scheme, executed in a scheme of green and primrose, while ventilated ceiling lamps serve to illuminate the interior, together with bracket fittings—all switch controlled.

Half-way along the corridor, on the left, is the cash desk, while another interesting section on the opposite side is a model all-gas kitchen, complete with cooker, built-in refrigerator, wash-boiler, and sink water heater. Many of the appliances are arranged in recesses, above which are concealed gas lights which illuminate them effectively. These lamps are controlled by a master switch in conjunction with a clock control which automatically extinguishes them after business hours at predetermined times.

The main heating of the showrooms is worthy of special note. This is effected on the Plenum air conditioning system, an up-to-date plant being housed for this purpose in the basement, in conjunction with Ideal boilers, which also provide the domestic hot water supply and central heating for both the showroom and four model flats which the Company have equipped at the rear of the premises. The latter in themselves provide a fine example of modern gas service.

Demonstration Theatre.

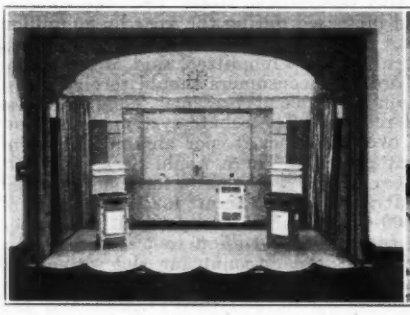
The Plenum air conditioning plant also serves the fine demonstration theatre on the first floor. This theatre is arranged to accommodate over two hundred persons, red plush tip-up seats rising in tiers to provide an uninterrupted view of the demonstration area at the bottom. Curtains can be drawn aside to reveal built-in kitchen fittings, including sink, with water heater above, refrigerator beneath the draining-board, and also built-in cabinets. Ante-rooms are provided on either side for the use of the demonstrator, while a convenient little " consulting room " is to be found at the back of the theatre for personal interviews with consumers. Cookery demonstrations are being arranged regularly in this theatre, which should be of great interest to local housewives. In addition, provision is made for the showing of films, a screen being lowered in front of the demonstration area for the purpose. The opening demonstrations are being given all this week by Miss M. K. Gompertz, M.C.A., of Messrs. R. & A. Main, Ltd., at which refreshments are being provided for those present.

Altogether, the Hornsey Company are to be congratulated not only on the acquisition of so fine a site for their new showrooms, but also on the erection and equipping of such magnificent premises, which cannot fail to attract their consumers.

Inaugural Luncheon.

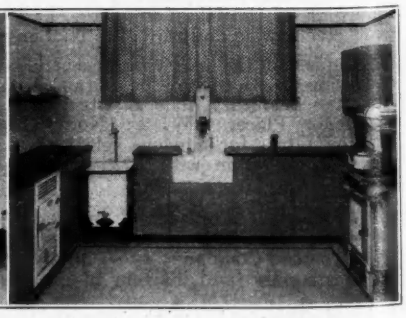
To mark the opening of the new showrooms an inaugural luncheon was given by the Directors in the demonstration theatre last Thursday, which was attended by His Worship the Mayor of Hornsey (Councillor Winkley, J.P.), the Mayoress, the Deputy-Mayor, the Borough Surveyor, and others.

The Chairman of Directors (Mr. A. M. Paddon) presided, and was supported by Mr. G. W. Carey (Deputy-Chairman), Mr. E. L. Burton, F.S.A.A., and Mr. J. W. Buckley, M.Inst.C.E. (Directors), Mr. Hyde C. Burton (Auditor), Mr. K. Leslie Mortimore, A.C.A. (General Manager and Secretary), Mr. G. C. V. Gandon (Engineer



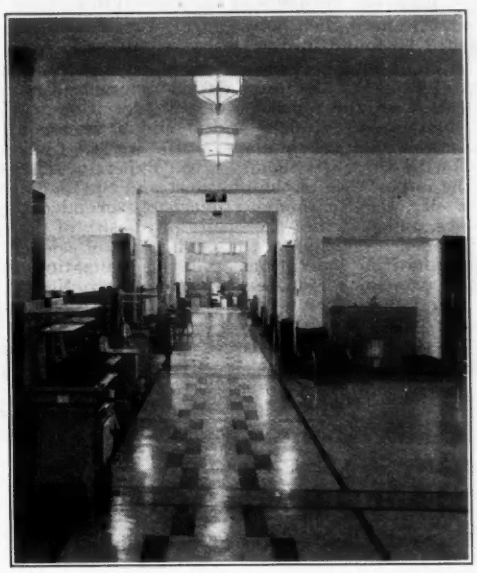
Demonstration Area in the Theatre.

A Section of the Main Showroom.



The Model Kitchen.

and District Superintendent), together with other senior officers of the Company. Also present were Mr. H. C. Smith (Engineer of the Tottenham and District Gas Company and President of The Institution of Gas Engineers), Mr. E. V. Evans (General Manager of the South Metropolitan Gas Company), Mr. P. E. Browne (General Manager of the Brighton, Hove, and Worthing Gas Company), Mr. D. C. Cross (Engineer and General Manager of the Lea Bridge District Gas Company), Sir Charles Morgan (Director of the Brighton Company), Mr. J. H. Dyde



A view down the Showroom towards the Water Heating Display at the far end.

(Acting General Manager of the North Middlesex Gas Company), Mr. S. Dawes and Mr. P. G. J. Carter (representing the Architects of the new premises).

The Loyal Toast having been honoured, Mr. PADDON extended a cordial welcome to all the guests, and especially the representatives of the Hornsey Borough Council, whose presence, he said, was evidence of the goodwill and co-operation which existed between the Company and the Borough of Hornsey. He thanked the Mayor particularly for his interest in the Company's latest enterprise.

HIS WORSHIP THE MAYOR, in reply, thanked the Company for its hospitality, remarking that it had paid a great compliment to the Town Hall in the manner in which it had arranged the new premises to conform architecturally with it. The Hornsey Gas Company, he said, was no small concern; nor was it carried on in a haphazard way. There were business men at the head of it who were not afraid of coming to the front and showing what the Company could do. They had come into the midst of their consumers to show them what the Company could produce and assist them in making the best use of the commodity it was distributing. So long as the Company did that, it need have no fear that it would not succeed. The Borough wished the Company all the success it would wish itself.

Continuing, the Mayor said that the Council hoped in the near future to put up a building opposite in competition with the Gas Company; but that competition would be carried on in a sound business manner. During all the years the Company had been in the Borough in every instance the feeling between it and the Council had been on the best of terms, and the Company could rely upon this continuing. So long as it did, there need be no fear that any trouble would arise. They could work together to the advantage of both. In conclusion, Councillor Winkley gave them the Toast of the Hornsey Gas Company, with the hope that it might enjoy the success it deserved for many future generations.

. . . the Sincerest Form of Flattery.

An interesting little side-light on the Mayor's remarks in regard to competition is contained in the following extract from a recent issue of the *Hornsey Journal*:

> "The coveted site of the telephone exchange, together with No. 26, Crouch End Broadway, was allocated to the Electricity Supply Committee for new showrooms and offices in accordance with a recommendation of the Special Committee.
>
> "This scheme, which will cost £20,000, is deemed necessary on the following grounds: (*a*) *That the erection of modern showrooms by the Hornsey Gas Company on the other side of the Town Hall forecourt makes it imperative that similar accommodation equally central should be provided by the municipal electricity undertaking*, and (*b*) that the present office accommodation at the electricity works is so limited as to make complete efficiency impossible." (The italics are ours.)

The paragraph was headed: "THE EFFECT OF GAS COMPANY'S ENTERPRISE."

The Future of Airdrie Gas-Works

Bulk Supply Scheme Rejected

The scheme whereby the Airdrie Gas Department were to have received a bulk supply from the Coatbridge Gas Company will probably be abandoned in the near future. The sub-committee appointed to consider the question have recommended the Airdrie Town Council to refuse a bulk supply on the grounds that the rates were uneconomical.

The plant at the Airdrie Gas-Works is obsolete, and the Committee consider that were new plant installed the Council would be in a position to supply gas at a cheaper rate than could be obtained with the proposed bulk supply. It has been suggested by the Coatbridge Gas Company, however, that there exists the alternative of the purchase of the Airdrie Undertaking by the Coatbridge Company. The Committee have recommended that the alternative proposal, together with that for the erection of new plant, should be considered by the Council.

Health Week at Cardiff

Cardiff's Activity in a Great Cause

Associating themselves with the National Health Movement, the Cardiff Gas Light and Coke Company last week held a series of meetings in their demonstration theatre, where large gatherings were addressed on health matters by eminent authorities in the fields of medicine, physical culture, and dietetics.

Mr. H. D. Madden, Engineer and Manager of the Cardiff Company, has been kind enough to send us the following particulars of the lectures which began on Monday, Oct. 4, with an Address by Mrs. D. D. Cottington-Taylor, of the Good Housekeeping Institute, on "Nutrition and National Fitness." The following day, Miss A. G. Hughes and Miss Muriel Davies, of the Milk Marketing Board, dealt with the "Health Value of Milk." Dr. W. Powell Phillips, M.R.C.S., L.R.C.P., Deputy Medical Officer of the City of Cardiff, lectured on Wednesday on "Maternity and Child Welfare." On Thursday, Sir Percy Alden, M.A., of the Sir Richard Stapley Educational Trust, talked on "Science and Health." The concluding session was devoted to the subject of "Physical Fitness," the lecturer being Miss Diana Ware, of the League of Health and Beauty.

Manchester District Association

General Meeting at Manchester

The Manchester District Association of Gas Engineers will hold their Ordinary General Meeting at the Midland Hotel, Manchester, on Friday, Oct. 15. Luncheon will be taken at 1 p.m.

The General Meeting will be held at 2.30 p.m., at which a Paper will be given by Mr. J. H. N. Thompson, B.A., on "Fusion Welded Pressure Vessels."

Manchester and District Juniors

Visit to Partington

The thirty-ninth Annual Meeting of the Manchester and District Junior Gas Association was held at the Partington Works of the Manchester Gas Department on Oct. 2, 1937.

During the afternoon the Works were inspected by 150 members, and great interest was shown in the Cooke-Holton process whereby road tar is prepared by utilizing the sensible heat of the gas. All crude tar is dehydrated by spraying in collecting mains and circulating in batches to any required viscosity.

The Whessoe Woodall-Duckham detarrer claimed the attention of the visitors, a 99·5% efficiency of tar fog removal being obtained by its use.

Careful attention was also paid to liquor treatment. Approximately the first 12% of liquor made is removed from the retort house wells and circulated in the vertical retort house foul mains. After concentration, ammonium chloride is recovered by direct evaporation. The remaining liquor is pumped to the dephenolating plant, where crude phenols and cresols are removed by washing with crude benzole. The efficiency of phenol removal is 90%.

A Group taken at the Meeting. The President is seated on the right, and next to him is Mr. A. L. Holton (Chief Engineer of the Manchester Corporation Gas Department).

After the visit, the members were entertained at tea in the Works dining-room, where Councillor Clapham, Deputy-Chairman of the Works Committee, welcomed the Association.

Mr. R. L. Greaves (St. Helens) proposed a very hearty vote of thanks to the Chairman and Members of the Manchester Gas Committee for their hospitality, coupling with it the name of Mr. A. L. Holton, the Chief Engineer. The Partington Works was a wonderful enterprise, particularly from a chemical point of view, and every facility was always given to inspect the various processes.

Mr. D. Benson (Bolton) seconded the vote of thanks.

Alderman Sir William Davy, in responding, said that it had given him much pleasure to be present, for the juniors were the people who did the work.

A business meeting was held in the evening, when the following officers were elected for the session 1937-38:

President.—J. Albinson, B.Sc., A.I.C. (Manchester).
Senior Vice-President.—T. Caldwell, M.Eng. (Widnes).
Junior Vice-President.—H. Platt, M.Inst.Struct.E. (Bolton).
Hon. Treasurer.—E. Kenyon (Middleton).
Hon. Auditor.—J. H. Cadman (Manchester).
Hon. Secretary.—F. Johnston, F.C.I.S. (Manchester).

J. Speers, B.Sc. (Eng.), A.M.Inst.Gas E., was also appointed to the Council.

During the evening Mr. Holton presented, on behalf of the Past Presidents, a medallion to be worn by future Presidents, as an insignia of office. He said that it was a tangible expression of the feelings the Past-Presidents still retained for the Association, and also of the benefits they had derived from being members.

Mr. Caldwell suitably acknowledged the emblem, and said that he was particularly proud to be the first to wear it. The Association had behind it the best wishes of the Past-Presidents, and this gave great encouragement to the Officers and Council.

A small replica of the medallion was then presented to Mr. Caldwell by Mr. Butterworth on behalf of some of the oldest members of the Association. Mr. Butterworth said that it was remarkable to observe the number of Past-Presidents who held high positions throughout the Industry, and who were always ready to testify to the benefits received by being members of the Association.

Mr. J. Albinson then delivered his Presidential Address, which will be found in our last week's issue.

Mr. A. K. Collinge (Preston) proposed a vote of thanks, congratulating Mr. Albinson on the manner in which he had dealt with the question of tar fog. Fog was absolutely distinct from vapour and should be removed before condensation had taken place. He wished to associate himself with the chief theme of the Paper, which emphasized the importance of the physicist and the Chemical Engineer. Mr. H. H. Thomas (Liverpool) seconded the vote of thanks, and said that the future prosperity of the Industry depended largely upon the application of science, both in manufacturing operations and the utilization of gas. Scientific principles had been carried into practice at Partington, and those who were responsible for their application were to be congratulated.

Mr. W. Buckley (Manchester) and Mr. D. M. Henshaw supported the vote of thanks. Mr. Albinson suitably replied.

Health Lectures at Dukinfield

Successful Exhibition at the Jubilee Hall

A highly successful Home and Health Exhibition organized by the United Kingdom Gas Corporation in conjunction with the Hyde Gas Company, which is controlled by the Corporation, was held in the Jubilee Hall, Dukinfield.

The opening ceremony on Sept. 20 was performed by the Mayor of Dukinfield, in the presence of thirty Councillors and many prominent local residents. The attendances during the week were highly gratifying. Out of a total of 7,000 consumers, attendances during the week reached the figure of 4,109. In addition to this, 800 school children attended lectures on four mornings during the exhibition week. These lectures were delivered by Mr. T. Bowen-Partington. The children were conducted around the exhibition, the details of each appliance being explained to them, and before leaving were presented with a souvenir Mr. Therm brooch. Cookery demonstrations were given each day by Miss Gillham, of Messrs. R. & A. Main, Ltd.

The manufacturers, co-operating with the Corporation to make the exhibition the success it was, included: Messrs. R. & A. Main, Ltd., Richmonds Gas Stove Company, Ltd., Stoves, Ltd., Ascot Gas Water Heaters, Ltd., and W. H. Dean & Son, Ltd.

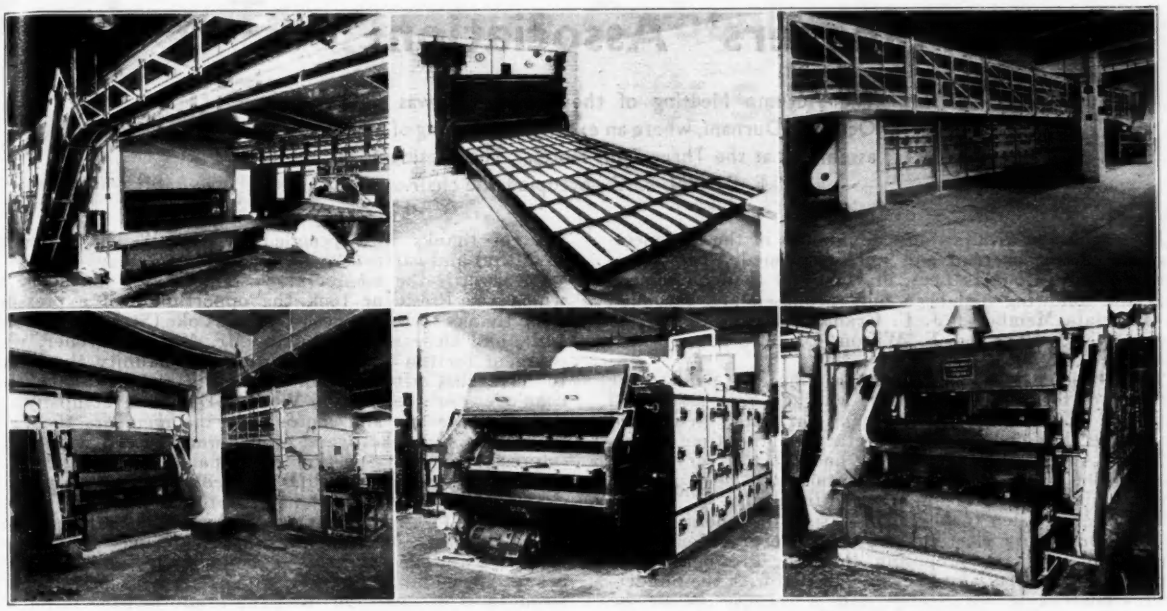
Spennymoor's Public Lighting

Ministry of Health Enquiry

A Ministry of Health Enquiry into Spennymoor Urban Council's lighting was held last week, when the Council applied for sanction to borrow £3,480 to cover the capital cost of the change over from gas to electricity for street lighting. The inquiry was conducted by Mr. M. R. Atkins.

Objections were made by the Spennymoor and Tudhoe and Tudhoe and Sunderland Bridge Gas Companies, the Weardale Steel, Coal, Coke and Iron Company, and a number of private ratepayers. Evidence in support of the change was given by Council officials. Mr. Norman Harper appeared for the Gas Companies and the Weardale Company. Addressing the Inspector, he said he understood the majority in favour of electricity on the Council was small. It had been freely admitted that it was not an adequate scheme, and Mr. C. F. Meikle (Clerk), he said, had admitted that the Council could not afford to put into force an adequate scheme. Therefore he considered it was a waste of money to spend £3,480 on a scheme suggested by the Council. He pleaded that the condition of the district did not justify the expense. The Inspector said he would inspect the lighting himself, and the result of the enquiry will be made known in due course.

Gas-Fired Bakery Ovens at Middlesbrough



We are indebted to Mr. J. W. Pallister (Engineer and Manager of the Middlesbrough Corporation Gas Department) for the above photographs of a number of interesting installations of gas-fired bakery ovens. This load is going ahead at Middlesbrough, and these examples include ovens by Baker-Perkins, Ltd., and Pelkman Bros., Ltd., of both travelling and drawplate types.

Athletic and Social

Gloucester Profit Sharing and Savings Scheme.

The annual meeting of the members of the Profit Sharing and Savings Scheme of the Gloucester Gas Light Company was held on Oct. 1. The chair was taken by Mr. J. H. Jones, J.P., a Director of the Company.

The Committee's report on the scheme showed that 249 members had standing to their credit a total of £20,644. The bonus of 5½% declared by the Directors on the total wages earned by the members for the year ended June 30 last amounted to £1,854. Since the scheme began in 1908 the sum of £27,178 had been distributed to the members as bonus, and £8,009 as interest. Also up to date the members had saved by deduction from wages the total sum of £18,041.

The Chairman, in moving the adoption of the report, said the scheme had been of benefit to members in many ways, and their thanks were due to the Committee for all they had done to make the scheme a success. Mr. W. H. Ford seconded the adoption of the report. The report and statement of accounts were unanimously adopted.

Mr. Morgan Matthews paid a warm tribute to the services of the Secretary (Mr. C. I. Poyner), referring to his great interest in the scheme and the considerable amount of time he devoted to it. Mr. S. T. Cowcher (one of the Auditors) said that any thanks they might pass to Mr. Poyner were well deserved.

The thanks of the members were heartily accorded to Mr. Poyner, to the Company, and to Mr. J. H. Jones and Mr. Morgan Matthews, whose heart and soul had been in the scheme since its inauguration.

Mr. J. H. Jones and Mr. F. W. Rogers, the two retiring members of the Management Committee appointed by the Directors, were re-elected, as also were the employees' representatives, Messrs. R. C. Brunsdon and W. H. Ford.

Watford Co-Partnership Meeting.

The twenty-eighth annual meeting of the employees of the Watford and St. Albans Gas Company was held on Oct. 5 at the Watford showrooms. The Chairman and Managing Director, Mr. Frank H. Jones, presided, and was supported by Messrs. Henry F. H. Jones (Deputy Chairman), C. Chambers, H. N. Lipscomb, F. Wilson (Directors), G. Wilks (General Manager and Secretary), T. C. Battersby (Chief Engineer), W. A. Evetts, H. C. Dunbar (Works Engineers), L. J. Kerrison, W. C. Cherry, F. G. Painton (Employees' Representatives), B. H. Almond, and E. T. Warren (Officials). About 200 co-partners were present.

At the outset, the Chairman asked all to stand in memory of two Directors, Mr. Henry Brown and Mr. R. T. Kent, who had recently died. In proposing the adoption of the report and accounts, Mr. Jones referred to the appointment of the new Deputy Chairman, Mr. Henry F. H. Jones, and Mr. H. N. Lipscomb as Directors' representatives on the Committee. Also it was the first time that Mr. F. Wilson had been present as a Director of the Company, and he (the Chairman) would like to welcome him on behalf of the co-partners. Mr. T. S. Godwin (Watford Works Manager) had retired since the last meeting and Mr. W. A. Evetts had taken his place on the Committee. Continuing, the Chairman said that this was the twenty-eighth year co-partnership had been in existence in the Company and he could rightly say that the year had been a record one. The savings of the members during the year had exceeded last year's figures by £150, and £2,500 of stock had been allocated and transferred to co-partners during this period. The membership had reached nearly 650, which meant that more than two-thirds of the Company's employees were now co-partners. The Bonus and Interest which had been credited under the scheme amounted to £6,242 during the year, an average of nearly £10 for each employee. Since co-partnership had begun on the Company, £28,000 of stock had been allocated, which went to show the very rapid growth of the scheme.

Speaking of the Pension Fund, Mr. Jones said that 32 pensioners were now enjoying benefits from the fund the assets of which amounted to over £67,000. The Company had this year contributed the sum of £13,478 towards the Co-partnership Fund and the Pension Schemes. The members themselves were, of course, also contributing to the fund which would provide pensions for them all in the years to come. The membership of the new Group Life and Pension Scheme had now reached 140.

In conclusion, the Chairman moved the adoption of the report and statement of accounts for the year ended June 30, 1937, which was carried unanimously.

Mr. W. C. Cherry was re-elected Employees' Representative on the Co-partnership Committee and Mr. T. C. Wall as Co-partnership Auditor.

Mr. G. Wilks, General Manager and Secretary of the Company, spoke in appreciation of all the work that was done for the Funds by Mr. Warren and his staff, and also of the work of the Co-partnership Committee. He was grateful for all that the Directors were doing for the employees and assured them that the Company had a very loyal and worthy band of people. He said that the Chairman correctly stressed the point that he wanted the right sort of co-partner on the Company. He also said it was not often that one had an opportunity of expressing thanks to the Chairman and Directors, but he felt sure that everyone was very grateful for the concessions and benefits which were received from time to time. Mr. C. Wilkins then proposed a hearty vote of thanks to the Chairman and Board of Directors. The Directors then entertained all present to tea, after which much interest was taken in the display of photographic efforts by co-partners.

North of England Gas Managers' Association

Autumn Meeting

The Autumn Meeting of the Association was held on Oct. 8 at Durham, where an excellent gathering of members assembled at the Three Tuns Hotel. The President, Dr. J. T. DUNN, F.I.C., occupied the chair.

In accordance with custom the minutes of the last meeting were taken as read and were confirmed. The Secretary (Mr. H. Douglas Lees, of Hexham) then announced that the following had been duly proposed and seconded as Associate Members: J. C. Graham (Newcastle), S. C. Irvin (Newcastle), and F. Wilson (Middlesbrough), and they were duly elected.

The President then moved that a tribute be paid to the memory of the late J. H. Curry, who had been associated with the Sunderland Gas Company for many years and was General Manager and Secretary at the time of his death in August last. Mr. Curry had taken a very active part in the work of their Association and he would be greatly missed. The members stood in silence.

The meeting then took great pleasure in honouring Mr. C. Dru Drury, by electing him an Honorary Member of the Association. In proposing this the President mentioned that Mr. Drury had been associated with the Sunderland Undertaking for nearly half a century before he retired from the post of General Manager in July last, while still retaining his seat on the Board. He was elected a member of their Association in 1892, and had ever since then been assiduous in his attention to its well-being. He was President in 1898-99, and rendered his year of office conspicuous by his work in furthering its interests. No words of his were needed to express their appreciation of Mr. Drury, and he was pleased that the Association had up its sleeve, so to speak, the Honorary Membership which was somewhat jealously reserved for those whom they particularly wished to honour. In fact, if they did elect Mr. Drury he would become only the third, the other two being their old friends Mr. Herbert Lees, of Hexham, and Mr. Thomas Hardie, of London.

The proposition was enthusiastically received and Mr. Drury was duly elected.

The President then referred to a gap which had been left in the ranks of their officers by the departure from Sunderland of Mr. A. M. Bagshaw, who was Vice-President of the Association and was due shortly for the Presidency. All the efforts of the Committee to persuade Mr. Bagshaw to retain his Vice-Presidency had been of no avail; he had, unfortunately, not been able to see his way to acceding to their appeals. It was their suggestion therefore that they fall back once again upon the willingness to serve of Mr. Drury, and invite him to occupy the vacant Vice-Presidency. Mr. Drury very kindly accepted this invitation and was duly elected.

The following students were congratulated on their success in the examinations of The Institution of Gas Engineers:

GAS ENGINEERING (HIGHER GRADE).

J. R. Clark, S. G. Irvin, both Newcastle; S. P. Ormerod, Bridlington; and S. E. Wright, Stockton.

GAS SUPPLY (HIGHER GRADE).

J. Smith, Workington; J. C. Graham, G. W. Robson, W. A. Scott, W. Sutcliffe, Newcastle; W. E. Weatherley, Hexham.

GAS ENGINEERING (ORDINARY GRADE).

L. Nelson, Hull; R. B. Smith, South Shields; W. G. Smith, Newcastle; R. H. Swift, Hull.

GAS SUPPLY (ORDINARY GRADE).

J. Topping, Carlisle; J. E. Clark, Sunderland.

Dr. Dunn then gave his Presidential Address, which is reproduced in full in other columns of this issue. As is customary there was no discussion, but a hearty vote of thanks was carried on the proposition of Mr. J. R. Bradshaw (Hartlepool). They would all agree, he said, that although, as the President had claimed, he was not actively a member of the Gas Industry, he had given them a most interesting Address which had recalled to many of them some of their earliest work in the Industry. He, Mr. Bradshaw, was one of those who stated unhesitatingly that, in his opinion, "Sulphur must go." Personally he welcomed the presence in his town of a Gas Examiner, which not only kept them up to the mark as regards quality, but had the effect of, so to speak, placing a hall mark on the product which they offered to the public. The vote of thanks was seconded by Mr. W. M. Galleway (Whitby) and carried by acclamation.

Afterwards the members re-assembled for luncheon, at which the President took the opportunity of expressing their thanks to Brancepeth Gas and Coke (Strakers & Love), Ltd., and their representative, Mr. Martin Greener, who is Agent for the Company, for the opportunity they were to have that afternoon of inspecting the installation of coke-ovens erected by the Woodall-Duckham Company.

By private car and motor 'bus the members then adjourned to the coke ovens, which were viewed with great interest under the direction of a capable corps of guides.

The plant consists of 59 Becker coke ovens with a total coking capacity of 1,000 tons of wet coal per diem. Each oven holds 17 to 17½ tons, the coking time varying from 33 to 30 hours according to whether furnace or foundry coke is required. About 9½ gallons of tar per ton of coal are produced and some 2½ gallons of benzole having a strength of 87% at 120° C. The crude benzole is refined and produces about 1·7 gallons of motor spirit and 0·43 gallon of toluole.

The debenzolized gas amounts to about 12,200 cu.ft. of 530 to 540 B.Th.U. gas, equivalent to 65 to 66 therms, per ton. At the present time the plant is producing 10 to 10½ million cu.ft. of gas, half of which is used under the ovens. After a further quantity has been utilized for other works purposes, about 1¾ million cu.ft. is being used for distribution to neighbouring gas undertakings, though it is anticipated that a greater quantity will be required in the future. Some twenty miles of mains have been laid for this purpose, carrying unpurified gas at 8 lb./sq.in. pressure, which may eventually be raised to 20 lb. when the plant is working to full capacity.

Gas Undertakings' Results

Leamington.

The annual report of the Directors of the Leamington Priors Gas Company for the half-year ended June 30, 1937, states that the payment of the statutory maximum dividends—namely, 10% per annum on the Class "A" ordinary shares and 7% per annum on the Classes "B" and "C" ordinary shares, all less income-tax, are recommended. The quantity of gas sold shows an increase of over 2¼ million cu.ft., compared with the corresponding half-year of 1936.

Newton-in-Makerfield.

The annual report of the Engineer and Manager of the Newton-in-Makerfield Gas Department, Mr. F. C. Sylvester, states that for the year ended March 31, 1937, the total quantity of gas made was 116,855,000 cu.ft. and the quantity of gas sold 109,227,000 cu.ft., an increase of 4·4% over last year. The total coal carbonized was 5,825 tons, the gas made per ton of coal carbonized being 20,060 cu.ft., against 19,400 cu.ft. last year. The yield from residuals was £4,330, which represents 64·8% of the cost of coal used. The unaccounted-for gas figure was 6·53% of the total gas sent out, as against 9·62% last year, which is considered fairly satisfactory in a district where mining subsidence is prevalent. The financial statement shows a gross profit of £3,241, a balance of £95 being carried to appropriation account.

Stockport.

In his annual report, Mr. T. Reynolds, Engineer and Manager of the Stockport Gas Department, states that during the past year there has been an increase in the amount of gas sold of 38,344,700 cu.ft., equal to 3·23%. This follows an increase of 7% in the previous year and has necessitated the placing of an order for new vertical retort plant. Notwithstanding the decrease in the revenue from the sale of gas, a matter of £7,000, and in the amount of simple-hire rentals, an increased income had been obtained, due to a better return from the sale of appliances, the increase being £11,000. Residuals were up by £5,000. The trading profit was £48,000. The number of consumers has increased by 2,244 to 48,804. Gas sold for industrial purposes totalled 219,491,000 cu.ft., an increase of 30 million cu.ft. Sales of appliances from the showrooms brought in more than £63,000, against £43,339 last year.

The Low-Temperature Carbonization of Scottish Cannel

by

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I SUMMARY.

Interest in the utilization of cannel in the manufacture of gas was revived last year in a Paper by Jamieson and King presented and discussed at the 73rd Annual General Meeting of The Institution of Gas Engineers.[1] In this Paper were described the results obtained at the Granton Works of the Edinburgh Corporation Gas Department by the carbonization of a Scottish cannel in continuous vertical retorts under conditions of gas manufacture. These results showed that cannel, if available in sufficient quantity and of a quality equal to that investigated, offered considerable promise as a source of smokeless fuel, cheap gaseous therms and a high yield of a tar which was a potential source of motor spirit and fuel oil.

It is now of interest to record an investigation which gives details of the yields obtainable from the same cannel under the conditions of low-temperature carbonization. This parallel investigation provides an interesting comparison of the two systems of carbonization and of the properties of the corresponding products. The experimental work was carried out by Mr. D. MacDougall, Mr. H. Bardgett, Mr. G. Percival, Dr. F. A. Williams and Dr. C. M. Cawley.

The results show that carbonization under gas-making conditions compares favourably with low-temperature carbonization in the following respects:

(i) The yield of gas by the latter process is much less, although its calorific value is higher.
(ii) The yield of tar by the latter process is a few gallons less, and is not greatly superior to the high-temperature cannel tar for the purpose of hydrogenation.
(iii) The combustibility of the low-temperature coke is only slightly higher.

This comparison provides an additional reason for a national assessment of the quantities available in different districts of cannels of sufficiently high quality for gasification purposes.

II CARBONIZATION PLANT.

The plant used was a setting of Fuel Research Station narrow brick retorts at East Greenwich. These retorts were originally designed for the production of smokeless fuel from bituminous coals.

The cannel was obtained from the same source as that used in the Edinburgh experiments, viz., Newbattle Colliery, Midlothian. The cannel occurs as a band or rib varying from 6 in. to 11 in. in thickness in the Parrot seam at this colliery.

The Fuel Research Station retorts have been described fully elsewhere[2] and it is sufficient to compare the major dimensions of the retorts with those of the Woodall-Duckham retorts used at Edinburgh.[1]

TABLE 1.—*Comparison of Dimensions of Woodall-Duckham and Fuel Research Station Retorts.*

—	Height.	Major Axis.		Width.	
		Top.	Bottom.	Top.	Bottom.
1	2	3	4	5	6
	Ft. In.	Ft. In.	Ft. In.	In.	In.
Edinburgh retort	25 6	6 2⅜	6 6½	8½	19
Fuel Research Station retort	21 0	6 6	6 6	7	11

[1] Inst. Gas Eng. Communication No. 135, 1936.
[2] Fuel Research Technical Paper, 35, 1933.
J. F. Shaw and J. G. King, Trans. Inst. Gas Eng., 1933-34, **83**, 702.

In the F.R.S. retorts the combustion chamber temperature varies from 1,100° C. at the top to 950° C. at the bottom. These flue temperatures correspond with an inside skin temperature—the true carbonizing temperature—of 600° to 650° C. The combustion chamber temperatures used in the Edinburgh experiments varied from 1,400° C. at the top to 1,180° C. towards the bottom.

The mean analyses of the cannel used showed that it differed only a little from that used at Edinburgh. The results of analysis of the average sample are given in Table 2 in comparison with one of the Edinburgh samples.

TABLE 2.—*Analyses of Newbattle Cannel.*

—		Fuel Research Station Experiments.	Edinburgh Experiment F.
1		2	3
PROXIMATE ANALYSIS (air-dry)—			
Moisture	per cent.	3.2	3·0
Volatile matter ..	,, ,,	50·4	46·3
Fixed carbon	,, ,,	41·3	46·3
Ash	,, ,,	5·1	4·4
ULTIMATE ANALYSIS (dry)—			
Ash	per cent.	5·3	4·5
Carbon	,, ,,	78·5	80·8
Hydrogen	,, ,,	6·6	6·3
Nitrogen	,, ,,	1·3	1·3
Sulphur (total) ..	,, ,,	2·4	2·3
Difference (oxygen) ..	,, ,,	5·9	4·8
GRAY-KING ASSAY (dry)—			
Coke	cwt.	11·7	11·6
Tar	gal.	64·5	66·6
Liquor	,,	7·3	5·8
Gas volume	cu.ft.	3,790	3,720
Gas sp.gr.	(air = 1)	0·74	0·73

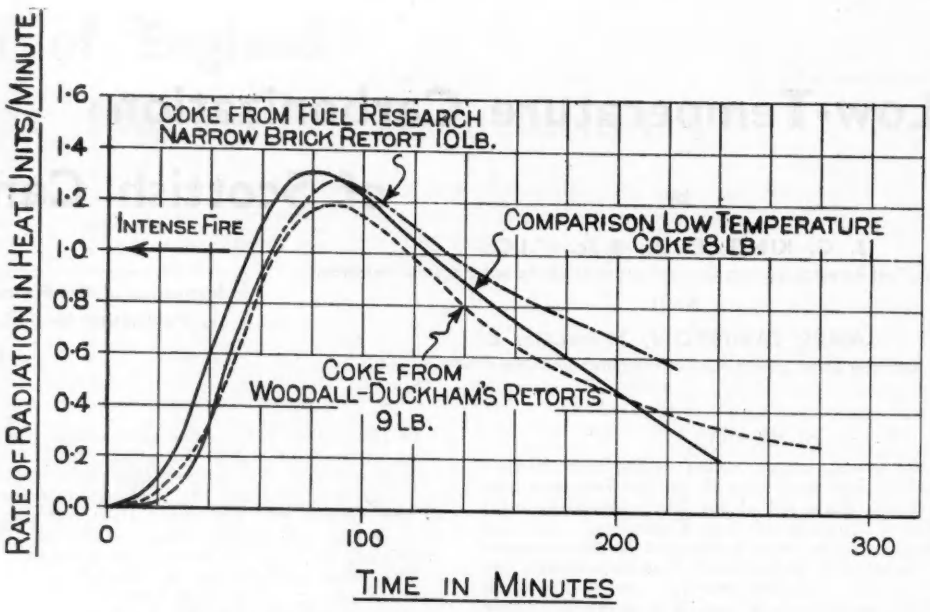
The coke in both cases was dull, fissured and hard, showing slight caking power.

After some exploration of carbonizing conditions it was found possible to treat the broken cannel up to a rate of 8·1 tons per retort per day. When conditions had been stabilized, after several days' running, a test of five days' duration was carried out in order to determine yields. During this time no trouble whatever was experienced in the operation of the retorts. It was necessary, however, to run the first condenser hot in order to prevent crystallization of wax before the separation of the liquor. When the temperature of the separator, which follows the first condenser, was maintained above 50° C., this separation was fairly satisfactory. Further separation was achieved by maintaining the wet tar at a temperature of 50° C. in a vertical separator until the liquor had been fully separated.

III COMPARISON OF YIELDS WITH THOSE IN EDINBURGH EXPERIMENTS.

It might be expected from the difference in the conditions of treatment that the cannel treated at the Fuel Research Station would show a smaller yield of gas and a higher yield of tar and that the coke, although not greatly affected in regard to yield, would show an appreciably higher combustibility. The comparative yields are shown in Table 3.

The differences between the two series of results are more or less those to be expected. The throughput in the low-temperature retort was not much less, despite the lower temperature of carbonization. The reasons for this are mainly the narrower retort, the permeability of the charge, and the less complete removal of volatile matter.



Combustibility in a Well Type Grate of Cokes from Newbattle Cannel.

TABLE 3.—*The Low-Temperature Carbonization of Cannel.*

COMPARISON WITH HIGH-TEMPERATURE YIELDS.

—		Low-Temperature.	Continuous Vertical Retorts.*
1		2	3
CANNEL—			
Charged per retort per day	tons	7·85	8·44
Moisture as charged ..	per cent.	2·6	3·0
Ash as charged	„ „	5·2	4·4
STEAM—			
Amount	per cent.	10·0	28·4
GAS—			
Yield per ton at 60° F. and 30 in.	cu.ft.	5,860	23,760
B.Th.U. per cu.ft.		808	487
Therms		47·3	115·7
Specific gravity (air = 1)		0·717	0·520
Inerts	per cent.	20·9	11·3
Gas spirit per ton ..	gal.	3·0	5·2
COKE—			
Yield per ton	cwt.	11·74	7·95
Breeze	per cent.	21·1†	25·2‡
Volatile matter, dry coke	„ „	6·8	3·3
Ash, dry coke	„ „	7·5	9·4
TAR—			
Yield per ton	gal.	47·1	54·0
Specific gravity at 15° C.		0·97	0·99
LIQUOR—			
Yield per ton, excluding scrubber water	gal.	18·9	20·8

* Taken from Edinburgh experiment F.[1]

† <½ in.

‡ <¼ in.

COKE.

The screen analysis of the coke is shown in Table 4 in comparison with that of the cannel charged.

TABLE 4.—*Screen Analysis of Cannel and Cannel Coke.*

Size.	Fuel Research Station.		Edinburgh (F).	
	Cannel.	Coke.	Cannel.	Coke.
1	2	3	4	5
Remaining on a 2 in. screen ..	57·7	18·5	41·6	2·7
Through a 2 in. on a 1 in. screen	22·0	35·9	31·3	55·2
„ „ 1 in. „ ½ in. „	12·8	24·5	8·2*	16·9*
„ „ ½ in. screen	7·5	21·1	18·9†	25·2†

* 1 to ½ in.
† <½ in.

These figures show that there was appreciable breakage of the cannel inside the retort. The extent of this breakdown was less as regards the splitting of the largest pieces, but greater as regards the production of fines than in the case of Woodall-Duckham vertical retorts. The latter difference may be due to abrasion in the narrower Fuel Research Station retort. The high proportion of breeze passing a ½ in. screen might be a disadvantage from the point of view of the production of smokeless fuel from cannel.

The conditions of carbonization were such that the residual volatile matter in the dry coke was appreciably higher than that in the Edinburgh coke, viz., 6·8 per cent., as compared with 3·3 per cent. This increase of volatile matter was reflected in an appreciable increase in combustibility. Combustibility tests were made by burning the fuel in an open grate. The results obtained according to the standard method are given in Table 5.

TABLE 5.—*Combustibility in a Well Type Grate of Cokes from Newbattle Cannel.*

Coke.	Heat for Ignition, B.Th.U.	Time to Reach "Intense" Fire, Min.	Duration of "Intense" Fire, Min.	Maximum Rate of Radiation, Heat Units per Min.	Charge Consumed, Per Cent.
1	2	3	4	5	6
Cannel (F.R.S.) ..	1,010	64	68	1·28	82
Cannel (Edinburgh) ..	2,070	80	68	1·23	72
Standard of comparison	1,120	56	66	1·32	76

These results are also shown graphically in the radiation curves above.

The low-temperature coke ignited easily and burned smokelessly. After some time, however, the fire became covered with a whitish ash which gave it a rather dull and unpleasant appearance. The coke was, however, a satisfactory fuel for use in a domestic open grate. It was rather more easily ignited than the corresponding Edinburgh coke. It burned up to a bright fire a little more slowly than the standard but the difference was not very great, and would be entirely overcome in a barred grate which allowed of a rather better draught through the fire.

GAS.

Owing to the low temperature of carbonization the gas from the Fuel Research Station retorts had the relatively high calorific value of 808 B.Th.U. per cu.ft. The yield per ton was 5,860 cu.ft., or 47·3 therms. If the recovery of spirit was carried out on this gas the yield would be 3·0 gal. per ton of cannel. The analysis of the gas is given in Table 6.

TABLE 6.—*Analyses of Gas from Fuel Research Station and Woodall-Duckham Retorts.*

—		Fuel Research Station Retort.	Woodall-Duckham Retort (F).
1		2	3
CO_2	per cent.	5·1	4·0
C_nH_m	„	8·6	3·7
O_2	„	*Nil*	0·3
CO	„	4·1	25·4
H_2	„	26·5	45·9
$C_n{}^*H_{2n+2}$	„	39·9	13·7
N_2	„	15·8	7·0
*n		1·33	1·20
Calorific value, B.Th.U. per cu.ft. (gross) ..		808	487
Specific gravity (air = 1)		0·72	0·52

A gas of this high calorific value would be valuable for enriching purposes.

Tar.

The yield of dry tar from the Fuel Research Station retorts was rather less than that obtained in the Edinburgh experiments. In the Gray-King assay the yield indicated was 64·5 gal. per ton of dry cannel, or 62·8 gal. per ton of cannel as charged to the retorts. The yield obtained of 47·1 gal. was therefore 75 per cent. of the assay yield. This compares with a percentage yield of 84 obtained in the Edinburgh experiment F.

This difference in yield between a vertical gas retort and a low-temperature retort is small, and is even in favour of the former retort. This is not normally the case with bituminous coals, and it would appear that the permeability of the cannel in the retort is such that the tar vapours escape freely through the charge without being subjected to more than a small extent to the higher cracking temperature of the inner retort surface.

In order to determine whether the low-temperature tar was more suitable for vapour-phase hydrogenation than that prepared at a higher temperature, experiments were carried out in a small-scale experimental plant.[3] In this plant the tar was passed over a molybdenum sulphide catalyst at a temperature of 480° C. and a pressure of 200 atmospheres of hydrogen. The main results of the experiment are recorded in Table 7, which gives the specific gravity of the oil product and the yield of spirit to 200° C. for each of five daily periods. In this table there are shown, for the purposes of comparison, corresponding results obtained from the Edinburgh tar and from a Fuel Research Station tar made from bituminous coal.

Table 7.—*Hydrogenation-Cracking of Cannel Tars.*

——	Cannel Tar from F.R.S. Brick Retorts.	Cannel Tar from Woodall-Duckham Retorts.	Dalton Main Tar from F.R.S. Brick Retorts.
1	2	3	4
Specific Gravity at 15° C. of Liquid Product.			
Period 1	0·828	0·852	0·867
„ 2	0·832	0·851	0·870
„ 3	0·838	0·855	0·879
„ 4	..	0·859	0·884
„ 5	..	0·859	0·889
Spirit to 200° C., per cent. by weight of Original Dry Tar.			
Period 1	37·5	29·4	45·4
„ 2	36·4	29·1	42·3
„ 3	34·5	28·7	40·1
„ 4	..	27·0	38·3
„ 5	..	26·6	37·4
Deterioration of the Catalyst (Periods 2–5).			
Increase in sp.gr. per period	0·006 (Periods 2–3)	0·003	0·006
Decrease in spirit to 200° C. per period	1·9 (Periods 2–3)	0·8	1·6

In experiments of this character the rate of deterioration of the catalyst may be measured by the increase in specific gravity of the product and the decrease in spirit yield. The rate of deterioration of the catalyst was greater with the low-temperature cannel tar than with vertical retort tar and almost equal to that with low-temperature tar from bituminous coal. On the other hand, the low-temperature cannel tar gave a product of lower specific gravity and richer in spirit than the vertical retort tar; both gave, however, less spirit than the bituminous coal tar.

Otherwise there was no marked difference between the behaviour of the two cannel tars, and the spirit and oil products had similar properties. The octane number of the motor spirit was low (59) and the cetene number of the dewaxed neutral oil suitable for diesel engines was 34. The wax in the tar was only partially acted upon during hydrogenation. In the original tar the wax amounted to 5·1 per cent., and in the hydrogenated product to 3·6 per cent. by weight of the original tar. This latter wax had a melting point of 48° to 49° C., and was nearly colourless. In the vertical retort cannel tar the percentage of wax was 5·8 and its melting point 54° to 57° C.

The fact that cannel tar is so little affected in respect of hydrogenation by the temperature of carbonization of the coal is a striking difference from the behaviour of bituminous coal. In the latter case it is practically impossible to treat in a vapour-phase process tars produced by continuous carbonization in a vertical gas retort.

The yields of oil products obtainable by the hydrogenation of the tar could therefore be as follows per 100 gal. of tar treated:

	Low-Temperature Tar.	Vertical Gas Retort Tar.
Motor spirit, gal.	47	36
Diesel oil, gal.	53	67
Wax, lb.	35	57

The spirit is rather low in anti-knock properties and would require treatment with lead tetraethyl to bring its octane number to the required value. The diesel oil is more promising, and should make a satisfactory light diesel fuel.

IV HYDROGENATION OF CANNEL.

Owing to the interesting results obtained in the hydrogenation of cannel tar it was decided to carry out some experiments comparing the behaviour of the coal itself in comparison with a bituminous coal. These experiments were carried out in a 2-litre converter under conditions which it was considered would give the best yield of oil. The coal was treated in the presence of a tar oil vehicle and either 2·5 per cent. of stannous hydroxide catalyst or 2·5 per cent. each of molybdic acid and sulphur. An initial pressure of hydrogen of 100 atmospheres and a final reaction temperature of 450° C. were employed. The yields of products from the cannel and from a bituminous coal, included for comparison purposes, are shown in Table 8.

Table 8.—*Hydrogenation of Newbattle Cannel and Beamshaw Coals.*

Per Cent. Dry Ash-Free Coal.

	Newbattle Cannel.		Beamshaw Coal.
Catalyst.	2·5 per Cent. $Sn(OH)_2$.	2·5 per Cent. MoO_3 + 2·5 per Cent. S.	2·5 per Cent. $Sn(OH)_2$.
1	2	3	4
Liquor	5·5	5·7	6·1
Insoluble residue	17·4	16·9	9·5
Chloroform-soluble material	75·0	66·4	81·2
Gas formation	− 1·4	..	4·0
Loss	3·5	..	Gain 0·8
Fractionation of chloroform-soluble material:			
b.p. below 170° C.	21·8	15·7	18·8
170°–230° C.	12·6	11·4	
230°–270° C.	4·9	1·6	
270°–310° C.	9·2	9·7	26·1
310°–360° C.	7·4	12·8	
above 360° C.	18·6	14·7	35·4
Loss	0·5	0·5	0·9
	75·0	66·4	81·2
Hydrogen used	4·9	..	5·1

The yields obtained in the experiments themselves were corrected for the presence of the vehicle in order to obtain results calculable to a basis of dry, ash-free coal.

It is shown that stannous hydroxide is a rather more effective catalyst than molybdenum sulphide for the treatment of cannel coal; in the case of bituminous coal tin is a much more effective catalyst than molybdenum.

The conversion of the cannel to oil soluble in chloroform is not so complete as in the case of the bituminous coal, but the quality of the oil produced is better since the amount of soluble oil boiling below 360° C. at atmospheric pressure is greater. This may be an important factor in the hydrogenation of cannel.

The Authors wish to thank the Director of Fuel Research and the Department of Scientific and Industrial Research for permission to publish this Paper.

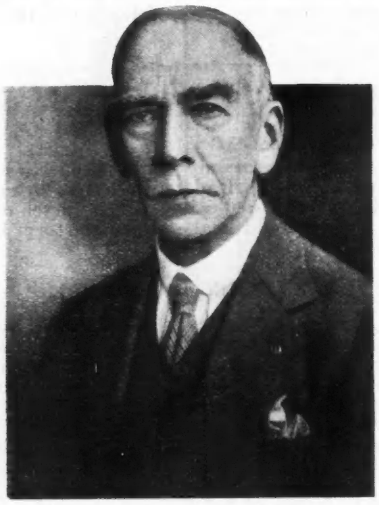
[3] J. G. King and M. A. Matthews, J. Inst. Fuel, 1932, **6**, 33

The Institute of Vitreous Enamellers

Change of Address

On and after Oct. 5, all letters to the General Secretary of the Institute of Vitreous Enamellers, Miss E. Christine Elliot, should be addressed as follows: The Secretary, The Institute of Vitreous Enamellers, 42, Napier Court, Hurlingham, S.W. 6. The telephone number remains unchanged—viz., Renown 2896.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.



THE PRESIDENT.

Presidential Address

OF

J. T. DUNN, D.Sc., F.I.C.

Presented at the Autumn Meeting of the Association, held at Durham on Friday, Oct. 8.

Mr. J. T. Dunn, J.P., D.Sc., F.I.C., is the Senior Partner in the firm of J. & H. S. Pattinson, Analytical and Consulting Chemists, of Newcastle-upon-Tyne. He was born in 1858 and obtained the degree of D.Sc. in 1888. At that time he was Headmaster of Gateshead School, whence he was appointed to a similar position at the Plymouth Technical School in 1894. The following year he became Principal of the Northern Polytechnic. Dr. Dunn, who is Public Analyst for Northumberland, Newcastle-upon-Tyne, Gateshead, Sunderland, South Shields, Tynemouth, and Berwick-on-Tweed, has served on the Councils of the following organizations: The Society of Chemical Industry, the Institute of Chemistry, the Society of Public Analysts, having been President of the first named during the 1933-34 session.

Some Reminiscences of a Gas Examiner.

In thanking you for the honour you have done me in electing me your President, I want to say that I appreciate that honour still more highly from the fact that I am not, professionally, one of your body, and have no claim to the position other than the interest I have taken for many years in the Gas Industry, if not as a gas engineer, at least as not wholly an outsider. As a gas examiner, I have had to keep a watch over the actions of the undertakings with which I was concerned; but my reception by them has always been of the friendliest. They have always regarded me as a friendly critic rather than an enemy, and have behaved throughout all these years so admirably that as a watchdog I have seldom needed to utter a warning bark, and do not remember any occasion when I have had to show my teeth. All the officials of all the undertakings with which I have had to deal (and there were more undertakings in my early days of gas examining than there are now) have throughout treated me with the greatest kindness and consideration, and we have all along been on the most excellent terms of friendship and companionship. I feel that it is as a testimony of that good relationship, rather than from any fitness of mine for the position, that you have elected me your President.

But that same fact of my not being actually occupied in the daily work of gas production puts me in a difficult position, when I realize that one of the President's duties is to address his members at the autumn meeting. Successive Presidents actually engaged in the Industry have been able to put before you accounts of progress and of improvements and inventions that were of the deepest interest to all of you, from their bearing upon your daily work; obviously it is impossible for me to do anything of the kind, and I found it very difficult to think of anything I could say that would be likely to be of use or interest to the members in general. But it is the privilege of age to be reminiscent, and I thought that if I gave up the idea of a formal address, and gave instead an informal talk about my own experiences in the Gas Industry, which date from what is now a fairly remote past, I might perhaps interest you, especially as these experiences do to some extent reflect, or serve as an index to, the progress and development of the Industry throughout this century. Accordingly I ask you to listen to some reminiscences and experiences of a Gas Examiner.

When in 1901 I entered into partnership with Mr. John Pattinson and took my share in the actual testing of the gas supplies the local undertakings were working under the Gas-Works Clauses Act of 1871, and were restricted in respect both of the illuminating power of the gas and of its content of sulphur compounds. The Newcastle Company's gas had to produce, at prescribed testing places, a light equal to 16 candles when burnt at the rate of 5 cu.ft. an hour, had to be free from sulphuretted hydrogen, and might not contain other sulphur compounds to an extent greater than that equivalent to 20 grains of sulphur per 100 cu.ft.

The illuminating power was tested in a photometer against actual candles. The candles were sperm candles, six of which weighed a pound, and each candle should, when lighted, consume sperm at the rate of 120 grains per hour. The gas was to be burnt at the rate of 5 cu.ft. per hour in a Sugg's No. 1 London Argand burner, using a chimney 6 in. long and $1\frac{3}{4}$ in. in diameter. There were regulations as to the length of time before the test for which the gas and the candles were to burn. The candles were weighed and the time noted, the candles were then placed in the photometer, and ten observations of the candle-power taken, at intervals of a minute, which were then averaged. The candles were extinguished, the time of doing this being noted, and were again weighed. From the loss of weight and the interval between the weighings, the amount of sperm consumed in ten minutes was calculated. It was assumed that for small variations in the rate of consumption the illumination was proportional to the sperm consumed, so that if the consumption was, say, 38 or 42 grains instead of 40 (for the two candles used), the observed candle-power was reduced or increased in the proportion of 38 or 42, respectively, to 40. This sounds quite straightforward, but, though the official candles were specified in great detail, both as to the material of which they were made, the material and structure of the wicks, and the process of manufacture, in practice there used to be great trouble in getting candles that would burn away uniformly at a rate close to 20 grains in 10 min. Accordingly, at the end of a test, one would find that 35 or 45 grains of candle had burnt away instead of 40; and as one could not assume that for such large differences the light varied in the same proportion as the candle consumption, the test had to be repeated with fresh candles, and sometimes more than once, so that the operation took a great deal of time, and was very trying to the patience of the operator. The effect on the operator was very frankly expressed in a Paper by Mr. Morton, of Philadelphia, in 1908, who said, "I am not defending the candle. I have passed too many hours with it, and been too closely associated with it, ever to want to see another. It has been painted in pretty black colours, however, and I believe that it is only fair to give it whatever commendation there is, for that is little enough."

It is not surprising, therefore, that many attempts were made to find a source of light that would be more constant than the candles and be free from the troubles associated with them. One of the most ingenious of these was the Methven slit. This was a metal screen placed in front of a No. 1 Argand burner burning at greatest efficiency, in which was cut a slit of such a size that the light from the burner passing through it was equivalent to that from two standard candles. Of course, assuming the correctness of that, observations of the candle-power of a gas were much easier to make and much more rapid than those using the candles. But the accuracy of such a mode of measurement depends on the certainty that the light from the Sugg burner, when used at greatest efficiency, is always of the same intensity. Experience showed that this could not be relied on, and though the Methven slit was very useful for daily routine testing and control, it was never prescribed for official tests.

After many years of work, one of the Gas Referees, Mr. Vernon Harcourt, devised and perfected a lamp burning pentane, which, when standardized, gave a light

equivalent to 10 candles. Pentane is a definite chemical substance of constant composition, so that one portion, obtained in a state of purity, is identical with any other portion, and can be relied on to behave in the same way under the same conditions. So the pentane lamp, used under prescribed standard conditions as to position, size of chimney, height of flame, &c., was found to be extremely accurate, and was prescribed, first in the Metropolis, later in the provinces (here, I think, it would be about 1907), as the standard source of light, and the candles ceased to be used. It was found to be entirely satisfactory, and remained the official standard until tests of illuminating power were abolished.

As early as 1871 the Gas Referees published a report on gas burners, in which they showed that the illuminating power of a gas depends on the burner in which it is used; and, in Argand burners, depends on the pressure—*i.e.*, on the rate of delivery of the gas, and on the size of the chimney—*i.e.*, the amount of air immediately surrounding the flame. They found, further, that with a given Argand and a given chimney, any gas was burnt most efficiently, that is to say, showed the highest candle-power, when the chimney was just filled with the flame. If more gas was supplied, the flame smoked and its brightness was diminished—if less, the flame was over-aired, and again lost its brightness. Now the No. 1 London Argand was so constructed that, burning gas at 5 cu.ft. per hr. and with a 6 by 1¾ in. chimney, 16 candle-gas would burn at its greatest efficiency. But a poorer gas burnt under those conditions would not be burning at its greatest efficiency; and a gas which showed, say, 13 candles under these conditions would, if its rate of consumption were heightened till the chimney was just filled with flame, show a candle-power of, say, 15·7 at 5·6 cu.ft. per hr, which, calculated down to 5 cu.ft., would give 14 as the candle-power of the gas. Gas undertakings, therefore, which under prescription were to supply 14-candle gas, would be prejudiced if their gas was tested in the standard manner, for their gas was not burnt in the test to the best effect. Representations as to the injustice of this were listened to by the Gas Referees, and in 1911 the use of the No. 1 burner was discontinued, and the "Metropolitan No. 2 burner" became the standard instrument. This was a burner devised by Dr. Carpenter, and had a metal disc at the bottom of the chimney, by screwing up which the air supply to the chimney could be lessened or shut off altogether. The gas was still to be burnt at 5 cu.ft. per hr., and the same chimney was to be used; but the air supply was to be diminished till the flame just filled the chimney, and any gas, except one too rich for the burner with the air supply fully open, could be thus burnt at its maximum efficiency.

With the pentane lamp and the No. 2 burner the ascertainment of the illuminating power of a gas was placed on a satisfactory basis, and no further change took place, as long as illuminating power was retained as a basis for the valuation of gas supplies. But as incandescent mantles became more lasting and more efficient, and supplanted to a constantly increasing extent flat-flame and Argand burners for lighting, and as a continuously rising proportion of the gas made came to be used, not for lighting, but for heating purposes, it was gradually realized that the illuminating power of the gas, burnt in the old burners, afforded no appropriate measure of its value or utility in these modern appliances; for in heating apparatus and in the burners for incandescent mantles alike, the luminosity was destroyed by the introduction of a sufficiency of air, and the true criterion of value lay in the calorific power of the gas. Such a radical change was not effected without a great deal of controversy, both on the advisability of the change itself and on the question whether, if calorific value were adopted as a measure of the value of the gas, there should be one uniform value prescribed for the whole country, or undertakings be left free to specify the calorific value of the gas they proposed to supply, and arrange their charges accordingly. Ultimately the measurement of calorific value was adopted for the official test, and at the beginning of 1917, as far as Newcastle was concerned, testing of calorific value began and testing of illuminating power ceased.

Undertakings were, within limits, allowed to declare calorific values for their products which they considered, in their local circumstances, most suitable for users and most convenient for their manufacture. The declared value in Newcastle was 475 B.Th.U. per cu.ft., which was altered to 500 in 1925, when the Walker and Wallsend Company, with a declared value of 525, was absorbed. During the first few years after the introduction of the test the calorific value varied widely, running between about 460 and 540; but gradually control over the quality of the gas was established, and now the variations from week to week do not exceed about 10 units.

The test is not only far more suitable for the valuation of the gas, used as it now is, than the test of illuminating power, but it is as a test far more satisfactory, for it depends on actual measurements given by the indications of appropriate instruments, and is independent of the imperfections or variations in the delicacy of human sensations.

Sulphuretted Hydrogen.

So much for illuminating power and calorific value. As far as sulphuretted hydrogen is concerned, the test is one of extreme simplicity, and the undertakings have had no difficulty in complying with the condition imposed. The existence of even traces of sulphuretted hydrogen in the gas is an event of very rare occurrence. In looking back over the records of almost 50 years, I find only about half-a-dozen occasions on which any has been detected, and then it has been traced to some breakdown that no vigilance could have prevented.

In regard to sulphur compounds other than sulphuretted hydrogen, the Newcastle and Gateshead Company's Act of 1867 had fixed the maximum quantity of these permissible in the gas at 20 grains of sulphur per 100 cu.ft., and that amount was again prescribed in the Act of 1879.

The Gas Referees in 1870 published a report on the sulphur question, in which they spoke very sympathetically of the difficulties experienced at that time by gas engineers in removing compounds of sulphur, pointing out that in many instances the gas after passing the purifiers contained even more sulphur than before it had entered them, and expressing a doubt whether the prescription, in 1860, of 20 grains per 100 cu.ft. for the London companies had not been a "leap in the dark." But the restrictions remained, and when I first became connected with the testing of the Newcastle gas, the processes of purification had progressed so far that considerable fluctuations in the sulphur content were very rare, and the amount usually lay between 8 and 12 grains per 100 cu.ft.—well below the maximum permissible.

In 1904 a Departmental Committee was appointed to inquire into and report on Gas Testing in the Metropolis. This Committee, speaking in their report about the injurious effects of sulphur compounds, said: "The evidence is conflicting. But it is not disputed that only a small percentage of the gas undertakings in the United Kingdom are required to take these sulphur products out of the gas they supply. Nevertheless it does not appear that any complaints have been made by the inhabitants of other districts on the ground that the gas thus unpurified causes injury to health or is more destructive to articles such as leather, &c., than it is supposed to be in London." And accordingly they recommended that "The obligation placed upon the companies with regard to the removal of the sulphur impurities, other than sulphuretted hydrogen, should be abolished, but that testing for information only should continue to be made in such manner and to such extent as may be prescribed by the Referees." The Committee's recommendations were adopted, and the London companies were released from all restrictions in regard to sulphur compounds other than sulphuretted hydrogen.

It was felt then by the other companies who were under restrictions that as the London companies had been released, the time had come when they, too, should make an effort for release, and a bill was promulgated in Parliament with this object. The Newcastle Corporation was rather alarmed at this, and asked Mr. Pattinson for advice on the matter. We made a long series of experiments, burning in one of two adjacent rooms the gas as supplied by the Company, containing 10 or 12 grains of sulphur per 100 cu.ft., and in the other a gas which we enriched so as to bring the sulphur up to 30, 40, 50 grains per 100 cu.ft. We made no attempt to measure the actual amount of sulphur in the air, but had regard simply to our sensations. We found that prolonged burning of the ordinary gas (the room being closed except for the natural ventilation of the fireplace) caused a feeling of stuffiness, but we were never able to detect sulphur dioxide by the smell; but when we raised the content to 30 grains per 100 cu.ft. the smell of sulphur dioxide was always perceptible and, of course, became more pronounced as the sulphur content of the gas was further increased. Except for the smell of sulphur dioxide, however, there was no indication that the air of the room, with the 30-grain gas, was worse to breathe, or in any way more objectionable than that of the room with the ordinary gas.

Evidence was given on both sides before the Committee in charge of the Bill, but eventually the Bill became an Act, and the companies were relieved of all liability to forfeiture on the ground that their gas contained excessive amounts of sulphur compounds other than sulphuretted hydrogen.

Testing for sulphur was continued, for information only. After the removal of the restrictions the sulphur in the Newcastle gas rose at once, and there were very wide variations in its amount. For the two years 1906 to 1908 its average was 21, not very much above the former pre-

scribed maximum; but it varied from 8 or 10 to over 40. For the next 20 years the variations were not so great, but the yearly averages ran between 16·5 and 28, the average for the whole period being 22·1. During the year 1929-30 the sulphur fell to an average of 10·9, and from that time to this it has never risen above 12, nor fallen below 6, the average for the year 1936-7 (July to July) being 6·7.

During those 22 or 23 years of high sulphur there was never, so far as my experience goes, any serious damage or inconvenience due to sulphur fumes, so that the action of Parliament in freeing the companies from the sulphur restrictions has been amply justified. It is to be remembered that during those years the old flat-flame burners were replaced almost universally by incandescent mantles, and that in any individual room probably less gas was used for illumination than formerly; and that this no doubt lessened the effect that might have been produced in the old conditions. But whether the damage or inconvenience caused by burning gas containing relatively large amounts of sulphur compounds be considerable or not, these substances are at least not desirable, and it must be matter of gratification to us that our gas now contains so much less sulphur than it did, not only after but before the removal of the restrictions.

It may be asked—indeed often has been asked—whether these restrictions and examinations are desirable, and really in the interest of the consumer, or whether the Industry might not have made more rapid progress, and have served the public better, if from the beginning it had been left unfettered, to develop as circumstances and its managers had allowed. No doubt restrictions on any industry are in themselves undesirable; but we must remember two things: First, that each gas undertaking has in its district a monopoly, and is devoid of the stimulus to development which competition always supplies, and next, that these restrictions were imposed in the first instance 60 or 70 years ago. Nowadays, gas undertakings (as well as many other traders) have realized that the surest way to prosperity is to give the best service to the public, and have acted on that principle; but when these restrictions were imposed it was a common practice among traders to try to make extra profit by giving the customer less than he bargained for, and no doubt the authorities thought that gas undertakings would be tempted to do the like, and, as monopolies, would be able to do it very successfully, unless they were under supervision.

In any case, even though restriction and supervision may have hampered the Industry, it has triumphed over them, and now presents the spectacle of an organized Industry, second to none in the benefits it confers on the community, and an example to others in its efficiency and its enterprise.

Third National Coal Convention

A "JOURNAL" Representative reviews the proceedings of this Convention organized by the Coal Utilisation Council.

For its Third National Coal Convention, the Coal Utilisation Council decided to leave London, where the two previous Conventions had been held, and go to the Provinces. Harrogate was chosen, and it cannot be said that the move was a wrong one. Judged by all the standards which govern conventions of this nature, this Third National Coal Convention was entirely successful, and it may be surmised with a certain amount of accuracy that the C.U.C. will continue this policy. At the moment, the affairs of the Coal Utilisation Council are not as tranquil as they might be. Mr. W. R. Gordon, the Director, who has built up a really wonderful organization with very limited resources, has felt compelled to resign for the frankly expressed reason that funds are not coming in as amply as he—and, indeed, the Council as a whole—desires, a state of affairs which has prevented the development of the comprehensive programme which was originally contemplated. Throughout the whole existence of the C.U.C. there has been the handicap that the support promised by the coal industry has not been forthcoming, and propaganda has consequently had to be curtailed. The blame for this has been placed largely on coal merchants—about which more will be said a little later—but it was made perfectly clear at Harrogate that with or without Mr. Gordon—and no tribute could be higher than that given to him by everybody concerned—the work of the C.U.C. will continue.

The attendance at the Harrogate Convention was excellent. In round figures, there were some 500 delegates from all over the country, and although the attendances at the London Conventions were perhaps a little larger, there were special reasons, and, as mentioned, there seems every probability that the experiment of going out of London, at all events for a number of years, will be continued.

Coming to the Convention itself, it must be said that it was splendidly organized and a series of Addresses and Papers was secured which can only be described as comprehensive in character. Dealing with the proceedings more or less in chronological order, the opening day provided the high spot from the general public point of view. The Council was happy in having the Convention opened by H.R.H. the Princess Royal, who, in a neat little speech, spoke of the importance of the coal industry nationally and of the dependence of our industrial prosperity upon it, all of which called for the development of the resources of the industry to the fullest possible limit.

Then came Lord Horder with an Address on "Health and the Home." The Gas Industry has for many years had practically the unanimous support of the medical profession for the gas fire, but the C.U.C., taking a leaf out of the book of the Gas Industry, went to a leading member of the medical profession, and there were smiles of satisfaction all round when Lord Horder championed unequivocably the open fire, and not only the open fire, but the open fire burning raw coal! Naturally this received a great deal of daily Press publicity which, unfortunately, tended to mislead, because, as usual with the type of report which the daily Press provides, this advocacy of the open fire using raw coal was given rather without its context. It is perfectly true that Lord Horder in his Address, and later in answer to a question, unashamedly expressed a preference for the raw coal fire, but in other parts of his Address he spoke of the need for preventing smoke, and said what a splendid thing it would be if this could be eliminated. The inference throughout was that although he preferred the open fire with its flickering flames it was up to those concerned to remove the disadvantages of it in the way of smoke, inconvenience by way of labour in removing ashes and dirt, storage accommodation for coal, and so on. It rather seemed to the careful listener that he was "passing the buck" on to the C.U.C., and even the most ardent advocate of the open coal fire will not argue that these difficulties have been or, indeed, ever will be either in part or completely removed. There are many parts of Lord Horder's Address with which the Gas Industry will agree. For instance, his amusing comments about the inconveniences of many of the modern flats which are being built to-day, and the absurdity of building houses and flats without flues. However, Lord Horder, in speaking generally in favour of the flickering flame of the raw coal fire, was appealing to a receptive audience, in large measure, although there were many present who are working hard to extend the use of smokeless fuels of various kinds who were not quite so impressed. That was made clear in a few comments by way of discussion later. It all conjures up in the mind how many people directly interested in the sale of coal actually use gas for various purposes. Perhaps this would not bear too close scrutiny from their point of view. References were made at various times to the "back to coal" movement and the use of coal for cooking purposes. It all sounds a little astonishing in these days, and again the question might be asked how many of those now advocating raw coal for cooking and heating do not, in fact, make use of it themselves for this purpose. A few years ago, when electric cooking was being strongly advocated, there was a large meeting of electrical engineers, and one speaker, more honest than most, put the chairman in a quandary when he suggested that all those using electric cooking in their own homes should put up their hands. The chairman hesitated to embarrass his audience, and it can well be imagined that had the Chairman at any of the Sessions of the Coal Convention been put in the same position, *qua* the use of raw coal on the part of those engaged in the coal industry, so far as heating and cooking are concerned, he would have shown equal hesitancy.

Unconvincing to the Average Housewife.

However, this advocacy of raw coal in the open domestic fire received a great deal of publicity, but that it will be unconvincing to the average housewife there cannot be the slightest doubt. Incidentally, there was mysteriously placed into the hands of some of the ladies attending the Conference a leaflet stating that 7,000,000 women cook by gas!

A subject of outstanding interest to the Gas Industry was dealt with by Mr. B. H. Binder, Chairman of the South Wales Control Board, who presented a Paper on "How a Coal Marketing Seheme Works in Practice." The Gas Industry, of course, is fully aware of how these schemes work, and viewed from the critical angle it must be said that in this Paper and in all discussions upon the problem the outstanding feature always was how the miner, the owner, and the distributor can get more out of the industry. That is a worthy object, and the Gas Industry has no quarrel with the policy of making the coal industry an economically sound one. It was said that the miner, the owner, and the distributor must live, but it was left to our friend Mr. C. S. Shapley, of Leeds, to suggest that the consumer must also live. He pointed out that when the bottom was knocked out of the residual market, the Gas Industry would not have the money to pay the increased prices for coal which were being asked now, and were likely to be asked in the future. He also impressed upon those concerned with the marketing schemes that the Gas Industry held the view very strongly that central selling schemes should be under the obligation to supply the quality of coal required and that no preference should be shown to any class of consumer.

For the rest, the discussion on this Paper tended to be a little acrimonious as between owners and coal distributors, each blaming the other for many of the difficulties which are being experienced. At the moment there are a number of selling schemes in operation, and none of them is working on precisely the same lines. The result is that already the necessity for standardization is being brought prominently forward. Moreover, the steel industry also entered a complaint, during the discussion, of the effect of high coal prices upon steel production, and the possibility was foreshadowed of a vicious circle involving two basic industries in which increasing prices in the one would inevitably result in increasing prices in the other with detrimental effects upon the export trade.

Mr. Binder's general answer to these criticisms was that it would be unfair to expect the coal industry to subsidize other industries by supplying coal at uneconomic prices. His reply to Mr. Shapley caused a little laughter, for he said he saw no reason why a price should not be arrived at which, while giving an adequate wage to the miner and a fair return to the owner and distributor, was also satisfactory to the consumer "as far as that was possible." The last few words tickled some people.

A not unimportant result of the formation of the Coal Utilisation Council has been the establishment of the Combustion Appliance Makers' Association, which has been doing good work in regard to improving combustion appliances, both domestic and industrial. Mr. Herman Lindars, Chairman of C.A.M.A., read a Paper on "Practical Research in the Use of Coal," and he gave an outline of the work now being undertaken by the Research Council of that body, which is composed of representatives of C.A.M.A., the C.U.C., and consumers, and special stress was laid upon the collaboration of consumers. To a large extent this work is related to the industrial use of coal, and a great deal has been done in the classification of coal, but attention is also being devoted to domestic fires. Hitherto the work has had to proceed on somewhat limited lines, but it is claimed that the experiment has justified itself as regards both the results already obtained and what may be expected in the future. Programmes of work already in hand include a systematic investigation of the domestic fire—and this does not apply solely or even mainly to the use of raw coal, but to solid fuel generally—including grate design, reduction of smoke, easier lighting, and the causes and prevention of down-draught and smoky chimneys. In this field practical results have already been achieved and one appliance for fire lighting and smoke reduction by means of a turbulent gas jet is already being placed on the market. [See "JOURNAL," Jan. 20, 1937, p. 144.]

Research.

It has for some time been clear, however, that this work is growing so rapidly that its organization and finance will have to be put on a more permanent basis. The General Council of the Combustion Appliance Makers' Association came to the conclusion that the best course would be to establish a Coal Utilisation Research Council on the lines of the Industrial Research Associations already existing in other industries, and a Memorandum to this effect was submitted to the Mining Association of Great Britain in July. It is proposed to apply to the Department of Scientific and Industrial Research for a substantial grant in aid of this work. It was added that as a result of the work already done on the domestic grate the Association has ready for commercial production an apparatus which separates the ash from the cinders and leaves the latter ready for laying the fire for the next time. Work is also being done upon an open grate which stores its own fuel for 30 hours' burning. Further, an investigation is in progress at the Imperial College of Science with regard to air flow and the design of grates with the object of preventing down-draught and smoky chimneys.

In the course of the discussion on this Paper, Dr. R. Lessing said there were instances of the success of similar research ventures in other industries. Some 25 to 30 years ago, when the Gas Industry could see that the illumination side of their business was becoming less, and heating was becoming more important, gas heating appliances were shockingly crude; they were as bad at that time as were many of the ordinary domestic coal grates to-day. Therefore, the Industry commenced research, and this had resulted in remarkable improvement in the efficiency of gas appliances.

Other speakers took part in the debate, and there was general approval of the steps that are being taken in connection with research problems in the coal industry generally.

The Gas-Propelled Vehicle.

A Paper entitled "From Mine to Road—Coal and its Derivatives for Road Transport" was presented by Mr. H. E. McGillivray, of Sentinel Wagon Works, Ltd., who said that arrangements had been completed under which his Company would manufacture vehicles of the gas producer type. He added that during the past few weeks he had made a preliminary investigation of the market and had found that the success of the venture would depend very largely upon the assistance obtained from legislation and from the coal industry.

In the course of his Paper, however, he referred to the practicability of using town gas as an emergency substitute for petrol, and said this had been fully demonstrated during the war period. The chief disadvantage was the very small radius of action which, nevertheless, could be increased by the use of compressed gas.

The Paper pointed out the advantages of diesel oil over petrol as regards mileage run for the same consumption, and suggested that during normal times the most promising field for the gas vehicle was in competition with the lighter classes of petrol vehicles, where the diesel engine has not yet made appreciable progress. At the same time, even in the 4-ton payload class of machine, a really good diesel engine might cost anything up to £250 more than a petrol engine, and users might prefer to pay half this extra sum for a compressed gas vehicle with a view to obtaining a saving in fuel costs approaching that given by the best diesel engine. Low fuel cost, however, he continued, is not by any means the only advantage of the gas vehicle. Dilution of lubricating oil, always present in petrol engines, and amounting almost to a nuisance in the case of diesels, does not occur. Wear on the cylinders with the gas vehicle is lower since the "washing" action of petrol is absent, and carbon deposit is almost negligible owing to the complete combustion of the gas. Instant starting is another advantage, particularly valuable in winter, while the absence of CO in the exhaust is a feature that will be appreciated by anyone whose office window opens on to a busy 'bus route! While all this applies to a vehicle with an engine converted for compressed gas operation, the Author suggested it is probable that with an engine specially designed for town gas or coke oven gas operation still further economies could be effected.

He concluded on this part of his subject by saying that the question of gas distribution was one with which he did not feel competent to deal. It concerned the Gas Industry, but it was possible that unless some bold step was taken a deadlock would result in which the gas suppliers would be waiting for sufficient demands from gas vehicle operators, and vehicle builders would be chary of building vehicles limited in their radius of action by lack of refuelling stations. The establishment of compressing stations would undoubtedly be expensive, since to supply the equivalent of 1,000 gal. of petrol per day, a plant of 200 h.p. would have to work for about 16 hours out of the 24. However, it seemed not merely reasonable but imperative that every possible encouragement should be given *now* to vehicle operators to employ transport running on coal and its products, so that as many vehicles as possible might be able to carry on without delay. It was not enough to build machinery for the conversion of petrol vehicles, since a considerable increase in engine size was necessary in the cases of compressed coke oven gas and producer gas.

In the discussion, Mr. W. L. Boon (London and Counties Coke Association) said it was a startling fact that 99% of all the road vehicles in this country were petrol or oil

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driven, which must be a matter of very great concern not only to the Government, but to all thinking people. The matter was connected probably with capital cost. Commercial vehicle buyers wanted to secure the return on capital in a short time, and having seen the performance of producer gas vehicles during the past few years he said it could not be denied that their development was absolutely sound. If the application of energy and technical development were continued it would be an instrument by which a most valuable solid fuel market could be secured.

At various times during the Convention great credit was paid to the combustion engineers of the C.U.C. for the manner in which they had assisted users to get better results from their solid fuel appliances, and it is a matter of some interest to the Gas Industry from the point of view of the use of smokeless fuel—and perhaps some advantage—that as the result of representations by the C.U.C., at various times, there have been 680 conversions from oil fuel to solid fuel industrial installations, and in the case of no fewer than 220,000 which were originally intended to have been flueless, the designs were altered to include a flue or flues.

The Third National Coal Convention was an undoubted success from the point of view of the promoters. The Gas Industry, however, naturally cannot approve of a policy stressing the "back to coal" movement in so far as the public is being encouraged to use raw coal. The C.U.C. would be better advised to champion the cause of smokeless fuel in the various forms in which it can now be obtained.

French Gas Industry

Review of the 60th Congress of the Union Syndicale de l'Industrie Technique du Gaz en France

The 60th Congress of the Union Syndicale de l'Industrie du Gaz en France took place, as we have already recorded, in Paris between June 9 and 12, 1937, under the chairmanship of the President, M. A. Bazille.

Prizes of 5,000 francs each were awarded to MM. Besson, Delsol, and Fourrier for the Papers presented by them to the meeting held in October, 1936.

We commence, this week, our summary of the Reports and Papers presented to the Congress.

Temperature Measurements on Hot Surfaces

At the 1935 Congress [see "JOURNAL," 1935, 211, 221], A. Gouffé described apparatus for the accurate measurement of the surface temperatures of walls in the range 0-80° C. The apparatus has now been perfected. At the same time, the question of the measurement of higher surface temperatures than those previously under consideration has been investigated and a suitable form of apparatus based on total radiation has been developed.

The improvements made to the low-temperature apparatus consist in the modification of the sensitive element which is applied to the surface. The aim has been to secure, at the same time, a more robust mounting and one capable of attaining the wall temperature very closely. The sensitive element is formed of a brass disc 14 mm. in diameter and only 2 mm. thick. In the periphery of the disc is a recess 5 mm. deep and 0·7 mm. wide and in this recess is wound a 10 cm. length of a copper-constantan couple having varnished wires 0·2 mm. in diameter. The hot junction is situated in a narrow cavity pierced radially and extending to the centre of the disc. The wires of the couple pass through two minute holes situated in the back face of the disc and lead directly to a Dewar flask in which the cold junction is immersed. From the back of the disc projects a screw forming an integral part of the disc and screwed into a thin boxwood rod which forms an insulating support and which is connected to the Dewar flask by means of a spring mounting which affords good flexibility when the disc is pressed against a wall. When the apparatus is in use, the major portion of the back of the brass disc is thus in contact with the atmosphere and is thus in the same thermal exchange relations with the air as is the bare wall, the temperature of which latter is therefore disturbed to a minimum extent. The hot junction assumes the temperature of the wall to within 0·1° C. The apparatus should not be used at temperatures above 200° C., for there may be a danger of deterioration of the insulating varnish of the couple. In any case, above this temperature the domain in which radiation methods are of use commences.

In connection with the development of a suitable form of radiation apparatus for the measurement of elevated surface temperatures, the Author discusses the theory of the subject very completely and then describes the design of a suitable type of instrument conforming to the theoretical principles involved. A thermopile was adopted rather than a bolometer since its use is much more simple.

The instrument is contained in a chromium-plated case to afford protection against stray radiation. The working face is circular in form and has a large central aperture by which the radiation from the wall under investigation enters. Behind this aperture is a chromium-plated diaphragm to afford further protection against stray radiation. The thermopile itself, which has a resistance of 14 ohms, is housed in the case and consists of 16 constantan-manganin elements in the form of strips 7 microns thick, 0·4 mm. wide, and 10-12 mm. long. The cold junctions are formed on thick copper bars which have a high heat capacity in relation to that of the elements and are thus kept at a constant temperature. The hot junctions of the individual elements are disposed within a circle so as to receive the radiation which passes through the diaphragm. Between the thermopile and the case of the instrument is a water-jacket. The E.M.F. developed is measured by means of a potentiometer.

The instrument was graduated by means of a Leslie cube of 12 in. side containing, in one face, a cylindrical re-entrant black-body cavity 12 cm. in diameter and 15 cm. deep. The cube is filled with water or oil which is kept in circulation by means of a motor-driven paddle and supplementary vanes surrounding the cavity. Heating is effected by means of a resistance unit at the bottom of the cube. For still higher temperatures, a modified Leslie cube filled with lead is employed.

Since the instrument is of the radiation type, it measures the effective radiating temperature of a surface, whereas the contact pyrometer described earlier measures the actual surface temperature. From the two results, the emissivity of the surface may be calculated. Alternatively, if the emissivity of the surface is known, the surface temperature may be calculated from the effective radiating temperature.

For surface temperatures up to 200° C., the electromotive force of the thermopile is proportional to $T^4 - T_0^4$, where T and T_0 are respectively the absolute temperatures of the surface and the cold junction. For higher temperatures this proportionality may be retained if the thermopile aperture is fitted with diaphragms; but there is then a risk of error due to radiation from the diaphragms. It is therefore preferable to work with full aperture even though a straight-line calibration no longer results. The general form of the calibration curve may be determined by extrapolation with due regard to the heat lost by the elements of the pile and it suffices to fix, experimentally, two or three points of the curve by measurements on black bodies at known temperatures.

Gums in Gas

J. Arnaudeau described an investigation carried out at Gennevilliers as a result of the occurrence of gum deposits in a high-speed Rateau booster having a capacity of 1¾ million cu.ft. of gas per hour. The gradual accumulation of the deposit lowered the capacity of the machine to 75% of the initial value after 25 days of operation. It was found that the gum was soluble in cresylic acid and it was therefore decided to make use of cresylic acid for the periodical cleaning out of the booster. Accordingly, a suitable system for the forced circulation of cresylic acid into the working parts of the machine was installed. It embodies a 45-gallon storage tank and three injectors, giving a total throughput of cresylic acid at the rate of 5 gallons per minute. In view of the corrosive action of cresylic acid on copper, all the bronze parts of the circulating pump were replaced with similar parts of cast iron or steel.

To avoid losses of solvent, cleaning is effected when the booster has been shut down. The gas inlet and outlet valves are closed and the booster and the circulating pump

are started up. When the booster has reached full speed, its motor is shut off and the booster commences to slow down. When the speed has dropped to 3,500 revolutions per minute, the cresylic acid supply valve is opened and is allowed to remain open until the booster stops. This requires about 3 minutes, and during this time about 15 gallons of cresylic acid have been circulated. The cresylic acid removes the gum deposit both by solution and by mechanical means, and after the operation the capacity of the booster is restored to its full value. Experience showed that cleaning should be carried out after every 120 hours of operation. The cresylic acid is replaced after it has been used 12 times.

A complete examination was made of gum deposits collected from various parts of the machine and definite proof of the vapour-phase origin of the gum was obtained. Attempts were made to regenerate gum-forming hydrocarbons from the gum by thermal cracking, and condensates containing indene, styrene, and coumaron in small quantities were obtained. When vapour generated from the gum was passed over heated copper turnings and then into Afasaniev's reagent [" Industrial and Engineering Chemistry," Analytical Edition, 15/1/36, p. 15], evidence of the formation of *cyclo*pentadiene was obtained.

Successful attempts were also made to determine, in coal gas, the unsaturated hydrocarbons responsible for vapour-phase gum formation. Twenty cubic feet of the dried gas were passed at the rate of 1½-2 cu.ft./hr. into two absorption tubes immersed in a freezing mixture of acetone and solid carbon dioxide and each containing 20 c.c. of petroleum ether. The petroleum ether solution was then added to a chilled petroleum ether solution of a known weight of maleic anhydride, the mixture allowed to warm to room temperature and finally digested at 45-50° C. under a reflux condenser. The solvent was then evaporated in vacuo and the addition product of maleic anhydride *plus* gum-forming hydrocarbon was weighed. The reaction on which the method is based is that of Diels and Alder [Zeitschr. f. Angew. Chem., 1929, 42, 911]. Evidence of the presence of 25-60 grains of gum-forming hydrocarbons per 100 cu.ft. of debenzolized gas was obtained.

A method for the determination of nitric oxide in gas was developed. The nitric oxide is oxidized to nitrogen peroxide by means of aqueous potassium permanganate. The peroxide is absorbed in an acetic acid solution of metaphenylene diamine and the Bismarck Brown is estimated colorimetrically with use of a standard sodium nitrite solution also treated with the diamine reagent. Since the oxidation of the nitric oxide is incomplete a calibration curve must be established. Tests on the gas produced from various types of plant showed nitric oxide contents in parts per million as follows:

—	Maximum.	Minimum.	Mean.
Woodall-Duckham continuous vertical retorts	0·9	0·5	0·65
Inclined chambers	12·0	1·1	4·2
Carburetted water-gas plant	1·9	1·9	1·9

The low contest of nitric oxide in the continuous vertical retort gas was due to the close pressure control effected by means of governors and to the consequent prevention of passage of waste gas into the retorts. The constancy of the nitric oxide content of the carburetted water gas is in conformity with the inherent nature of the process of manufacture since at each cycle a certain quantity of nitric oxide present in the blow gas is introduced into the water gas as a result of purging.

The nitric oxide content of coal gas decreases progressively during the various stages of physical and chemical purification and may reach as low a figure as 0·25 part per million after the oxide purifiers. Backward rotation with revivification *in situ* appears to be less efficacious than are the older operating methods involving external revivification. Whereas backward rotation may reduce the nitric oxide concentration to 0·5 part per million, the older method may yield a figure as low as 0·15 part. This is due to the fixation of nitric oxide by the iron sulphide present in fouled oxide.

In a study on the synthetic formation of vapour-phase gum from gas charged with nitric oxide, *cyclo*pentadiene and oxygen, the findings of other Authors were confirmed—namely, that an induction period is involved and that the presence of water vapour accelerates deposition of the gum. In the induction period, peroxides are formed from the hydrocarbons and these finally catalyze gum formation.

(To be continued.)

Traffic Vibration

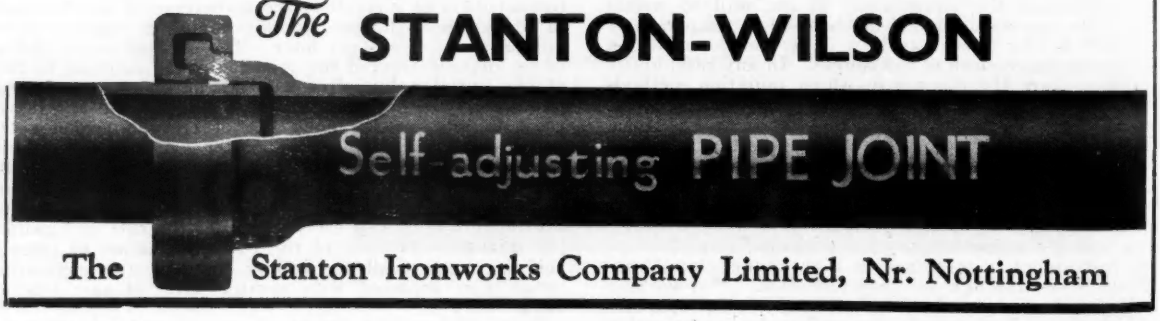
Rigid or Self-adjusting Joints?

Not many of the problems brought into being by the remarkable growth of road transport during the last decade are capable of easy solution.

There is at least one exception, however. For instance, though much has been heard of the danger caused to historic buildings by traffic vibration, the harmful effects of such vibration on water and gas mains are not so apparent. To water and gas engineers responsible, however, for the maintenance of these essential public services, this was a very real problem until a few years ago, for rigidly-jointed mains could not be expected to withstand the severe vibration caused by modern conditions.

Some six years ago the Stanton Company introduced the Stanton-Wilson Self-adjusting pipe-joint to overcome this and similar difficulties. That it has successfully done so is proved by the fact that more than 1,500 miles of Stanton-Wilson mains have now been laid by over 750 public authorities.

The **STANTON-WILSON**



The Stanton Ironworks Company Limited, Nr. Nottingham

Trade Notes

Benham & Sons, Ltd.: Birmingham Branch Opened.

Messrs. Benham & Sons, Ltd., 66, Wigmore Street, W. 1, have opened a branch office at Birmingham, the address and telephone number of which is; Royal London House, 35, Paradise Street, Birmingham, 1. Midland 6069.

Floodlighting Equipment.

There is valuable business to be obtained by the Gas Industry in the floodlighting of public parks, baths, recreation grounds, advertisement hoardings, showhouses, memorials, and scores of other objects whose prominence fades with the departing daylight. Much useful advice on the subject is to be found in a recent publication of Messrs. Foster & Pullen, Ltd., Avil Works, Crossley Hall, Bradford. The publication also gives details of the various floodlighting units stocked by the Company, and some illustrations of typical installations. An excellent medium for the cleaning of lamp reflectors of stainless steel, aluminium, chromium plate, porcelain, or vitreous enamel is Avil "Cleanol."

Blowing and Exhausting Fans.

We have received from Messrs. Keith Blackman, Ltd., 27, Farringdon Avenue, E.C. 4, a publication dealing with high efficiency type blowing and exhausting fans. As the title implies, these fans are so designed that a high efficiency is obtained over a very wide range of duties. Apart from low running costs (due to high mechanical efficiency) other advantages are claimed for these fans, including large capacity for the overall dimensions; adaptability as regards manipulation to suit variations in water gauges at fixed speeds; gentle and steadily rising volume-pressure characteristics when working from free to closed outlet conditions; absence of surging; quietness in operation; simple and yet robust construction; and low first cost.

Artistic Lamp Columns.

The need for adequate illumination of the kerb in the interests of safety is being increasingly recognized and was stressed once again at the A.P.L.E. Conference at Folkestone.

Concrete Utilities, Ltd., Great Amwell, Ware, Herts., make lamp columns to a number of designs giving overhangs up to 6 ft. Four of these were shown in Shorncliffe Road and were much admired. All the designs are for column and bracket in concrete, they suit the material used, and both in outline and colour are most pleasing to the eye.

This firm, who claim to be pioneers of concrete columns in England and the largest makers in the world, offer their long and extensive experience to engineers who have lighting schemes under consideration.

Thomas Smith & Sons (Rodley), Ltd.

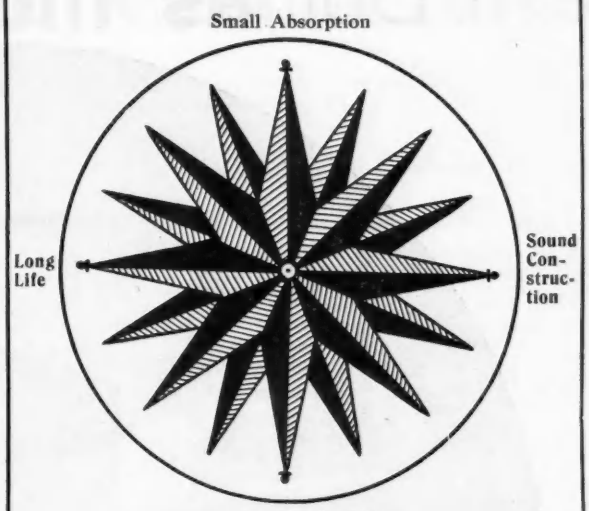
For well over a century the firm of Thomas Smith & Sons (Rodley), Ltd., Leeds, have been making cranes. During that time the firm have built up an enviable reputation for a reliable product, and, quite naturally, one would expect such a firm to think seriously before introducing any revolutionary process for production. Despite the scarcity and rising price of steel, the firm have actually speeded up production, although they are using less steel. It was realized that the introduction of welding would result in great economies both in materials, time, and money, and so the process was adopted by the firm. It was characteristic of the firm, however, that in the early stages they safeguarded themselves by employing both rivetting and welding. But that was several years ago, and to-day welding has replaced not only rivetting on almost all standard work but has gone a long way towards superseding castings and forgings.

Laboratory Balances.

There is at the present time available a wider and more accurate range of balances for use in the laboratory than at any other time in the past, and the models made by Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, W.C. 2, cater for all purposes and are available at all prices.

The balances in the new catalogue are classified according to type, and are arranged, as far as is practicable, in increasing order of price. Balances by various specialist makers have not been classed together as it has been thought that customers would be assisted to select models suited to their requirements if a ready price comparison were made possible. This system has, however, not been so rigidly applied as to render it inconvenient to refer to specific types of balances such as chainomatic, aperiodic, or micro-chemical, which will be found grouped together. In compiling this catalogue the firm have made a comprehensive survey of the literature of the best-known and most reliable balance makers, and a selection has accordingly been made which current demand would seem to indicate will be adequate to cover the needs of present-day weighing practice.

All the Cardinal Points



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Established 144 years

but as Modern as Tomorrow

Scene from the H. G. Wells' film "Things to Come," by courtesy of London Film Productions, Ltd.

YEAR by year improvement for well over a century is the story of Newton Chambers Iron Works. As a better process was discovered, they proved it—then used it ; a more proficient product they made it. That has been their policy in the past ; it is the policy of the Firm to-day

As modern as to-morrow then, but with the knowledge and experience of 144 years. A good combination ; it gives confidence.

Newton Chambers specialise in the manufacture of Blast Furnace Plant, Gas Works Plant, Steel Works Plant, General Chemical Plant, Benzole Plant, By-Product Plant, Cast Iron Tanks, Steel Tanks, Coke Oven Machinery, Pig Iron, Excavators, General Castings for the various trades and all forms of Light Castings.

NEWTON CHAMBERS & CO., LTD.
THORNCLIFFE ---------- NEAR SHEFFIELD

Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

The Stock Exchange passed through another erratic week and the general tone was dull. Some recovery in American stocks gave an impetus to markets for a time, but the latest disturbing political events led to some heavy liquidations and prices generally showed a reaction from the highest points reached during the week. There were exceptions, of course, though increases in value were mainly confined to the stocks of those companies announcing increased dividends—*e.g.*, Transport "C," Imperial Smelting Corporation, &c. The Italian answer to the Anglo-French invitation about Spain has been made known over the week-end, and this will doubtless have a further reactionary effect on markets during the current week.

The general conditions also extended last week to the Gas Market. A fair volume of business was recorded, but prices generally were inclined to weaken, and the quotations of several of the leading stocks closed lower. Gas Light units and South-Eastern Corporation both dropped 6d. to 24s.; Imperial Continental weakened 3 to 137½; South Metropolitan eased a point to 102½; while a sharp drop of 5 occurred in Alliance and Dublin ordinary to 165½. In the Supplementary List, the 4% preference stocks of both Associated Gas and Water and Associated Utilities were marked down 6d. The United Kingdom Gas Corporation 4% 1st redeemable cumulative preference stock at 19s.-21s. and the new 3½% redeemable debenture at 96-98 have now been included in the Supplementary List, and since the Corporation owns nearly the whole of the Scarborough and York ordinary stocks these have been taken out of the List.

It must be admitted that, in common with many other securities, the values of gas "ordinaries" have suffered to a considerable extent during the past twelve months. That the cause for these reactions does not emanate from within is evidenced by the latest Board of Trade Return (reviewed in last week's "JOURNAL") which clearly indicates a thriving Gas Industry. The responsibility rests almost solely on the uncertainties created in investment markets by political and financial disturbances abroad. The following table of some of the leading ordinary stocks and shares, the dividends on which were unchanged in 1936, indicates the extent of the depreciations since a year ago:

Quotations.

—	Oct. 9, 1936.	Oct. 8, 1937.	Fall.
Commercial	95—100	85—90	10
Croydon sliding scale	157 - 162	140—145	17
Gas Light units	27s. 3d.—28s. 3d.	23s. 6d.—24s. 6d.	3s. 9d.
Imperial Continental	155—165	135—140	20
Liverpool	135—137	125—127	10
Newcastle units	27s 9d.—28s. 3d.	23s. 9d.—24s. 3d	4s.
South Eastern	27s.—29s.	23s.—25s.	4s.
South Suburban	130—135	120—125	10
Tottenham	152—157	135—140	17
Wandsworth	159—164	140—145	19

On the other side of the picture, however, there were those companies which paid slightly increased dividends for 1936, such as Alliance and Dublin, Severn Valley Gas Corporation, Sheffield, &c., whose stocks or shares now stand a point or two above last year's quotation.

Current Sales of Gas Products

The London Market for Tar Products.

LONDON, *Oct.* 11.

There are no alterations to report in the prices of tar products, which remain as follows:

Pitch, 38s. per ton f.o.b.
Creosote, 6d. to 6¼d.
Refined tar, 3¾d.
Pure toluole, 2s. 5d. to 2s. 6d.; pure benzole, 1s. 9d.; 95/160 solvent naphtha, 1s. 8d; and 90/160 pyridine, about 11s.; all per gallon naked at makers' works.

Tar Products in the Provinces.

Oct. 11.

The average prices of gas-works products during the week were: Gas-works tar, 24s. 3d. to 29s. 3d. Pitch—East Coast, 37s. to 38s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 37s. to 38s. 6d.* Toluole, naked, North, 1s. 8d. to 1s. 9d. Coal tar, crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 1s. 3d. to 1s. 3½d. Creosote, *ex* works, in bulk, North, liquid and salty, 5d. to 5½d.; low gravity, 4⅜d. to 4½d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 4s. 1½d. to 4s. 3d. Naphthalene, £18 to £20. Salts, 90s. to 95s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Oct.* 9.

Market is still suffering from a lack of new business, but distillers are well sold on contract.

Crude gas-works tar.—Actual value is 37s. to 38s. per ton *ex* works in bulk.

Pitch remains quiet at round 30s. to 32s. 6d. per ton f.o.b. Glasgow for export, and 30s. per ton *ex* works in bulk for home trade.

Refined tar is available in substantial quantities at 3d. to 3¼d. per gallon free on rails for export, and 3½d. to 3¾d. per gallon *ex* works in buyers' packages for home trade.

Creosote oil.—There is only a limited quantity available for this year and prices are steady as under: Specification oil, 5½d. to 5¾d. per gallon; low gravity, 6¼d. to 6½d. per gallon; neutral oil, 5¼d. to 5½d. per gallon; all *ex* works in bulk.

Cresylic acid.—Buyers continue to hold off but sellers are maintaining prices as under: Pale, 97/99%, 3s. 11d. to 4s. 2d. per gallon; dark, 97/99%, 3s. 8d. to 3s. 10d. per gallon; and pale, 99/100%, 4s. 4d. to 4s. 7d. per gallon; all *ex* works in buyers' packages.

Crude naphtha is valued at round 6d. to 6½d. per gallon *ex* works in bulk, according to quality and district.

Solvent naphtha.—Quotations are being made at 1s. 5d. to 1s. 6d. per gallon for 90/160 grade, and 1s. to 1s. 1d. per gallon for 90/190 heavy naphtha.

Motor benzole is valued at about 1s. 4½d. to 1s. 5d. per gallon.

Pyridine.—Prices are nominal at 10s. to 11s. per gallon for 90/160 grade, and 11s. to 12s. per gallon for 90/140 grade.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole	0 9½	to	0 10	per gallon at works
Motor "	1 3	"	1 3½	" " "
90% "	1 4	"	1 4½	" " "
Pure "	1 8	"	1 8½	" " "

THE GLOVER-WEST SYSTEM

GETS THE MOST OUT OF THE COAL

The ease with which heat can be concentrated or distributed at will in the Glover-West vertical retort setting makes possible just that heat treatment required by the particular gas coals available. And this applies to recognised carbonizing coals throughout the world. Many of them have been investigated under full-scale working conditions in the test installation on the research gas plant at our Manchester works.

GLOVER-WEST

CONTINUOUS CARBONIZATION IN VERTICAL RETORTS

WEST'S GAS IMPROVEMENT CO. LTD • MILES PLATTING • MANCHESTER 10

STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Oct. 8	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,767,439	Stk.	Sept. 6	8	8	Alliance & Dublin Ord. ...	163—168	−5	...
374,000	,,	June 21	4	4	Do. 4 p.c. Deb. ...	95—100	...	...
558,890	,,	Aug. 9	7	7	Barnet Ord. 7 p.c.	158—163	...	...
300,000	1	Oct. 4	1/9⅜	1/4⅛	Bombay, Ltd.	26/—28/-*	−/6	27/4½—27/6
179,915	Stk.	Aug. 9	9⅜	9⅜	Bournemouth sliding scale ...	200—205	...	203½—205
590,407	,,	,,	7	7	Do. 7 p.c. max. ...	158—163	...	160—162
493,960	,,	,,	6	6	Do. 6 p.c. Pref ...	133—138	...	134
50,000	,,	June 21	3	3	Do. 3 p.c. Deb. ...	79—84	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	98—103	...	100½—102
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	116—121	...	...
357,900	,,	Aug. 9	7⅛	7⅛	Brighton, &c., 6 p.c. Con. ...	152—157	...	...
649,955	,,	,,	6½	6½	Do. 5 p.c. Con. ...	135—140	...	135—137⅛
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	127—133	...	...
855,000	,,	Sept. 20	8	7	British Ord.	146—151	...	...
100,000	,,	June 21	7	7	Do. 7 p.c. Pref.	140—145	...	...
350,000	,,	,,	5⅛	5⅛	Do. 5⅛ p.c. 'B' Cum. Pref.	110—115	+2	112⅛—112½
120,000	,,	June 7	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...	...
450,000	,,	,,	3⅛	3⅛	Do. 3½ p.c. Red. Deb. ...	95—100	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1⅛—2⅛	...	...
100,000	10	6 Nov. '33	4⅛	4⅛	Do. 4½ p.c. Pref. ...	1⅞—3⅛	...	...
150,000	Stk.	June 21	4⅛	4⅛	Do. 4½ p.c. Deb. ...	79—84	...	..
626,860	,,	July 19	6	6	Cardiff Con. Ord.	125—130	...	...
237,860	,,	June 7	5	5	Do. 5 p.c. Red. Deb.	107—112	...	...
98,936	1	Oct. 4	2/-	2/-	Colombo Ord.	1⅛—1⅞*	...	...
24,510	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref. ...	23/6—25/6*	+.6	25/—25/1½
739,453	1	Oct. 4.	-/11-48	-/11-48	Colonial Gas Assn. Ltd. Ord.	17/—19/-*	−1/-	...
296,144	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	22/—24/-*	−/6	...
1,775,005	Stk.	Aug. 9	5	5	Commercial Ord.	85—90	...	86—89
620,000	,,	June 7	3	3	Do. 3 p.c. Deb. ...	74—79	...	...
286,344	,,	Aug. 23	5	5	Do. 5 p.c. Deb. ...	113—118	...	...
807,560	,,	Aug. 9	7	7	Croydon sliding scale ...	140—145	...	143½—144½
644,590	,,	,,	5	5	Do. max. div.	108—113	...	110—111½
620,385	,,	June 21	5	5	Do. 5 p.c. Deb.... ...	113—118	...	116—117½
239,000	,,	Aug. 9	5	5	East Hull Ord. 5 p.c....	98—103	...	...
185,355	,,	Aug. 9	6	6	East Surrey Ord. 5.p.c.	120—125	...	...
176,211	,	June 7	5	5	Do. 5 p.c. Deb. ...	113—118	...	...
250,000	1	July 5	4	7	Gas Consolidation Ord. ...	20/—22/-	...	...
250,000	1	May 24	4	4	Do. 4 p.c. Red Cum. Pref.	19/—21/-	...	...
19,255,284	Stk.	Aug. 9	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	23⅛—24/6a	−/6	23.9—24/6
2,600,000	,,	,,	3⅜	3⅜	Do. 3½ p.c. max.	82—85	...	83—84
4,477,106	,,	,	4	4	Do. 4 p.c. Con. Pref. ...	99—102	...	100½
2,993,000	,,	July 5	...	3½	Do. 3½ p.c. Red. Pref.	100—103	...	102—102½
8,602,497	,,	May 24	3	3	Do. 3 p.c. Con. Deb. ...	76—79	...	78—79
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	111—114	...	112½—114½
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb....	111—114	...	112½—114½
700,000	,,	Sept. 6	3½	3½	Do. 3½ p.c. Red. Deb....	94—99	...	...
270,466	,,	Aug. 23	6	6	Harrogate New Cons. ...	120—125	...	...
213,200	,,	Aug. 9	6	6	Hornsey Con. 3½ p.c. ...	118—123	...	...
5,600,000	,,	May 24	8	12	Imperial Continental Cap. ...	135—140	−3	135½—140
223,130	,,	July 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...	...
285,242	,,	Aug. 9	8½	8½	Lea Bridge 5 p.c. Ord. ...	170—175	...	...
75,000	,,	May 24	†10	†10	Malta & Mediterranean .. Metropolitan (of Melbourne)	150—160	...	...
392,000	—	Oct. 1	5⅓	5⅓	5⅓ p.c. Red. Deb.	100—103	...	...
231,978	Stk.	Aug. 23	5	5	M.S. Utility 'C' Cons. ...	101—106	...	...
968,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	96—101	...	...
360,075	,,	June 21	4	4	Do. 4 p.c. Deb. ...	97—102	...	98
148,955	,,	,,	5		Do. 5 p.c. Deb. ...	115—120	...	...
125,000	—	July 1	3⅛	3⅛	Do. 3⅛ p.c. Rd.Rg.Bds.	96—99	...	...
675,000	Stk.	May 3	†6	†9	Montevideo, Ltd.	91—96	+2	92—94
250,000	,,	Aug. 9	7½	7½	North Middlesex 6 p.c. Con.	150—160	...	...
396,160	,,	Aug. 9	5	5	Northampton 5 p.c. max. ...	110—115	...	110½—111½
300,000	,,	Apl. 19	†9	†7	Oriental, Ltd....	162—167	...	...
468,537	,,	June 7	8	8	Plymouth & Stonehouse 5 p.c.	157—167	...	162½
621,667	,,	Aug. 9	8½	8½	Portsmouth & Gosport Cons.	164—169	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	104—109	...	...
73,350	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	...
441,275	1	Sept. 20	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	21/6—23/6	...	22/—22/10½
460,810	1	,,	-/10⅛	-/10⅛	,, ,, 4½ p.c. Cum. Pref.	19/6—21/6	...	...
133,201	Stk.	Aug. 23	5	8⅛	Shrewsbury 5 p.c. Ord. ...	130—135	...	...
1,371,752	1	Sept. 6	1/2⅜	1/2⅜	South East'n Gas. Cn.Ld. Ord.	23/—25/-	−/6	23,9—24,6
871,636	1	,,	-/10⅛	-/10⅛	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-	...	...
498,818	1	,,	4	4	Do. 4 p.c. Cum. Pref. ...	18/—20/-	...	...
450,000	Stk.	Aug 9	4	4	Do. 4 p.c. Deb. ...	99—102	...	...
150,000	,,	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	96—99	...	...
6,709,895	,,	Aug. 9	6	5	South Met. Ord.	101—104	−1	102—103
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf. ...	130—135	...	134
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf. ...	98—101	...	99—100⅛
1,895,445	,,	June 21	3	3	Do. 3 p.c. Deb. ...	75—80	...	76½
1,000,000	,,	July 5	5	5	Do. 5 p.c. Red. Deb....	110—113	...	...
1,543,795	,,	Aug. 9	6	6	South Suburban Ord. 5 p.c....	120—125	...	122—124
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	110—115	...	...
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	95—100	...	...
1250,000	,,	,,	...	§18/9	Do. 3½ p.c. Red. Pref.	98—101	...	100
888,587	,,	June 7	5	5	Do. 5 p.c. Deb....	115—120	...	116—118
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	98—101	...	98½
200,000	,,	Sept. 20	...	3½	Do. 3½ p.c. Red. Deb.	94—99	...	...
427,859	1	May 3	9⅜	1/2⅜	S. Western Gas & Water Ord.	19/—21/-	...	...
160,523	1	Apl. 19	-/10⅜	-/10⅛	Do. 4½ p.c. Red. Cum. Pf.	20/—22/-	...	...
110,000	Stk.	June 21	4	4	Do. 4 p.c. Red. Deb. ...	97—102	...	...
750,541	,,	Aug. 9	5⅜	5	Southampton Ord. 5 p.c. ...	111—116	...	...
148,836	,,	June 7	4	4	Do. 4 p.c. Deb.	97—102	...	...
350,000	,,	Aug. 23	5⅛	5⅛	Swansea 5⅛ p.c. Red. Pref. ...	110—115	...	110
94,000	,,	June 7	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	95—100	...	...
1,076,490	,,	Aug. 9	6⅜	6⅜	Tottenham and District Ord.	135—140	...	136—136½
409,835	,,	,,	5⅛	5⅛	Do. 5⅛ p.c. Pref....	121—126	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	112—113⅛
371,850	,,	June 7	4	4	Do. 4 p.c. Deb. ...	97—102	...	98½
888,629	1	Oct. 4	6	4	U. Kingdom Gas Cor. Ord.	20/—22/-*	...	20/3—20/7½
968,841	1	May 3	4⅜	4⅜	Do. 4½ p.c. 1st Cum. Pref.	20/—22/-	...	20/10½—21/-
745,263	1	June 7	4⅜	4⅜	Do. 4½ p.c.2nd Non-Cum.Pf.	17/—19/-	...	18/1½
700,000	Stk.	Sept. 20	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	96—99	...	96½
373,939	,,	Aug. 9	7	7	Uxbridge, &c., 5 p.c. ...	147—152	...	...
133,010	,,	,,	5	5	Do. 5 p.c. Pref. ...	109—114	...	...
1,371,138	,,	Aug. 9	7	7	Wandsworth Consolidated ...	140—145	...	...
1,620,615	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	...	117½
500,000	,,	,,	4	4	Do. 4 p.c. Pref. ...	97—100	...	98½
1,343,964	,,	June 7	5	5	Do. 5 p.c. Deb. ...	115—120	...	116½—117½
383,745	,,	,,	4	4	Do. 4 p.c. Deb. ...	97—102	...	...
556,342	,,	Aug. 9	7	7	Watford and St. Albans Ord.	140—145	...	144½
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	109—114	...	...
200,000	,,	,,	5⅛	5⅛	Do. 5⅛ p.c. Pref. ...	121—126	...	...
200,000	,,	June 7	4	4	Do. 4 p.c. Red. Deb.	97—102	...	...
100,000	,,	,,	3⅜	3⅜	Do. 3⅜ p.c. Red.Deb.	95—100	...	...

a.—The quotation is per £1 of Stock. " Ex div. † Paid free of income-tax. ‡ For year. § Actual.

Stock and Share List continued overleaf.

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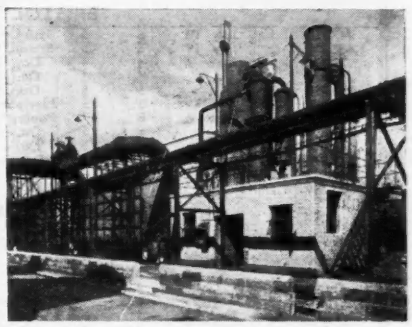

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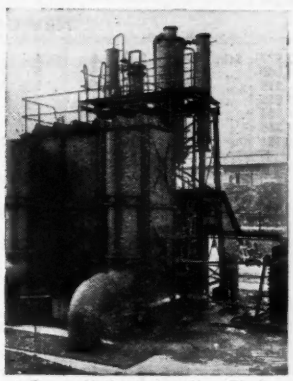

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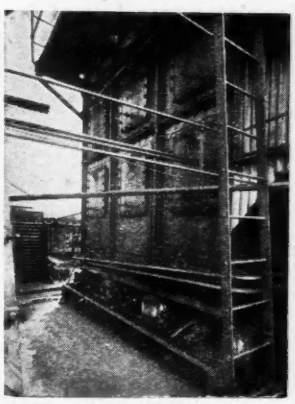

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STOCK AND SHARE LIST—Cont.

Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Oct. 8.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	July 19	6	5	Bath Cons.	120—122	...	...
1,667,250	,,	July 19	5	5	Bristol, 5 p.c. max.	117—118	...	...
120,420	,,	June 7	4	4	Do. 1st 4 p.c. Deb. ...	100½—102½	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	100½—102½	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	120—123	...	...
274,000	,,	July 19	5	5	Newport (Mon.) 5 p.c.max. ...	101—106	...	...
13,200	12	Sept. 6	8	7	Pontyp'l Gas & W. 10 p.c. 'A'	13—14	...	...
13,600	10	,,	6	5	Do. 7 p.c. 'B'	11½—12½	...	...
40,000	10	,,	6	5	Do. 7 p.c. 'C'	11½—12½	...	...
140,778	Stk.	Aug. 9	5	5	Weston-super-Mare Cons. ...	110—112	...	...
64,338	,,	June 21	4	4	Do. 4 p.c. Deb.	96—98	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	157—160	..	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Aug. 9	6½	5	Chester 5 p.c. Ord.	104—109	...	...
92,500	,,	June 21	4	4	Do. 4 p.c. Pref.	97—101	...	...
36,430	,,	,,	3½	3½	Do. 3½ p.c. Deb.... ...	89—92	...	...
41,890	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	98—102	...	...
2,167,410	,,	Aug. 23	6	6	Liverpool 5 p.c. Ord. ...	125—127	...	...
245,500	,,	June 21	5	5	Do. 5 p.c. Red. Pref. ...	99—104	...	...
306,083	,,	July 1	4	4	Do. 4 p.c. Deb. ...	102—104	...	...
106,280	,,	Aug. 9	10	10	Preston 'A' 10 p.c.	206—216	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	147—157	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Aug. 9	8	8	Blyth 5 p.c. Ord.	165—166	...	...
732,000	,,	Aug. 9	5	5	Hartlepool G. & W. Cn. & New	122—123	...	...
3,061,315	,,	Aug. 9	5⅛	5	Newcastle & Gateshead Con.	23/9—24/3a	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	99—100	...	...
776,706	,,	June 21	3½	3½	Do. 3½ p.c. Deb. ...	91—92	...	...
277,285	'	Nov. 2	5	5	Do. 5 p.c. Deb. '43...	108—109	...	...
332,351	'	Aug. 23	6	6	Sunderland 6 p.c. max. ...	139—141	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Aug. 9	9	6	Derby Con.	140—150	...	...
55,000	,,	June 7	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
20,000	10	June 7	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	105—110	+3	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Sept. 20	10	10	Great Grimsby 'A' Ord. ...	210—220	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	210—220	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—210	...	...
1,806,339	,,	Aug. 23	6	6½	Sheffield Cons.	145—149	...	...
95,000	,,	July 5	4	4	Do. 4 p.c. Deb.	100—103	...	...

Supplementary List of Stocks and Shares not Officially Quoted

202,152	Stk.	Sept. 6	25/-b	5	Ascot Ord.	100—105	...	...
128,182	,,	July 5	5	5	Do. 5 p.c. Pref.	108—113	...	110
573,156	1	May 24	5	5	Asscd. Gas and Water Ord. ...	19/6—21/6	...	...
167,506	1	...	...	...	Do. 4 p.c. Red. Cum. Pref.	19/—20/-	—/6	20/-
253,118	1	...	...	...	Do. 4 p.c. Irred Pref. ...	18/—20 -	—/6	...
500,000	1	May 24	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6	...	...
500,000	Stk.	Sept. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...	...
31,035	1	Aug. 23	...	/4½	Associated Utilities 4 p.c. Pref.	16/6—18/6	—/6	...
100,000	Stk.	...	...	...	Do. 3½ p.c. Red. Deb.	95—100	...	...
17,000	,,	Aug. 23	8	8	Bognor Orig. Ord. 'A' ...	160—170	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	160—170	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	141—146	...	...
37,440	,,	Aug. 9	10	10	Cam. Univ. & Town 10 p.c.max.	193—203	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	135—140	...	137—139
39,025	,,	,,	5	5	Do. 5 p.c. max.	98—103	...	...
65,000	,,	Aug. 9	8½	7½	Eastbourne 'A' 5 p.c. ...	158—163	...	...
198,000	,,	,,	7	6	Do. 'B' 3½ p.c.	128—133	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	108—113	...	...
130,000	,,	June 21	5	5	Do. 5 p.c. Deb.	115—120	...	...
24,000	30	Aug. 23	8½	8½	Great Yarmouth 8½ p.c. max.	44—49	...	41½
59,400	30	,,	7½	7½	Do. 7½ p.c. max.	44—49	...	...
51,160	Stk.	June 7	5½	5½	Do. 5½ p.c. Deb.	120—125	...	...
152,600	,,	Sept. 6	9	8	Guildford Cons.	170—175	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	110—115	...	...
68,250	,,	June 7	5	5	Do. 5 p.c. Deb.	113—118	...	...
156,600	,,	Aug. 23	7½	7½	Hampton Court Cons. ...	158—163	...	...
73,620	,,	Sept. 6	8½	8½	Luton Cons. 'A'	163—168	...	...
107,960	10	Sept. 20	5½	4	Mid Kent Ord.	8½—9⅜	...	...
230,940	Stk.	Aug. 9	10	10	Oxford & District Ord. ...	203—208	...	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	108—113	...	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	110—115	...	...
126,193	,,	May 3	7½	7½	Peterborough Ord.	159—169	...	...
64,990	,,	Sept. 6	7½	6½	Redditch Ord.	125—135	...	...
166,850	,,	Aug. 9	8	8	Romford Ord.	155—165	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	...
44,000	,,	Sept. 20	5	5	Do. 5 p.c. Deb.	113—118	...	...
25,570	,,	Aug. 9	5½	5½	Rugby 5½ p.c. Pref.	125—130	...	...
25,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	106—111	...	...
42,750	,,	June 7	5½	5½	Do. 5½ p.c. Deb.	122—127	...	...
10,950	,,	Aug. 23	8	8	Ryde Ord.	158—163	...	...
27,825	,,	Aug. 23	8	8	Shanklin & Ventnor Cons. ...	158—168	...	...
270,086	,,	Sept. 6	7	7	Slough Ord.	135—140	...	...
21,000	,,	June 21	5	5	Do. 5 p.c. Deb.... ...	112—117	...	...
28,872	1	May 24	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	19/—21/-	...	...
28,866	1	Sept. 6	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	18/6—20/6	...	...
137,730	Stk.	Aug. 9	7	7	Southgate & Dist. 7 p.c. max.	140—145	...	...
62,500	,,	,,	5	5	Do. 5 p.c. Pref.	110—115	...	...
117,228	,,	Aug. 23	5	5	Swindon Cons.	106—111	...	...
60,425	,,	June 7	5	5	Do. 5 p.c. Deb.	110—115	...	...
64,380	,,	June 7	5	5	Torquay and Paignton 5 p.c. Pf	110—115	...	...
500,000	1	...	...	...	United Kingdom Gas Corpn. 4 p.c. 1st Red. Cum. Pref.	19/—21/-	...	20/—20/3
300,000	1	Sept. 20	...	23/4c	Do. New 3½ p.c. Red. Deb.	96—98	...	96—97¾
130,000	Stk.	Aug. 9	8	5	Wakefield Ord.	120—125	...	...
81,650	,,	,,	5	5	Do. 5 p.c. max.	103—108	...	...
82,000	,,	Aug.	6	6	Weymouth Ord.	103—108	...	...
98,384	,,	Aug. 9	6	6	Wolverhampton 6 p.c. Pref....	125—130	...	...
160,000	,,	June 21	5½	5½	Do. 5½ p.c. Rd. Db	108—113	...	...
90,000	,,	June 21	5	5	York 5 p.c. Red. Deb. ...	105—110	...	...
133,640	,,	July 19	6¼	6¼	Yorktown (Cam.) 5 p.c Cons.	128—133	...	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	108—113	...	...
35,000	,,	June 7	5½	5½	Do. 5½ p.c. Deb.	123—128	...	...

a The quotation is per £1 of Stock. b Actual for Quarter. c Actual. * Ex div.

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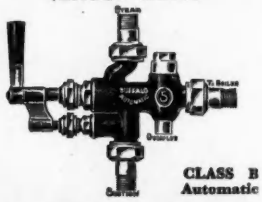
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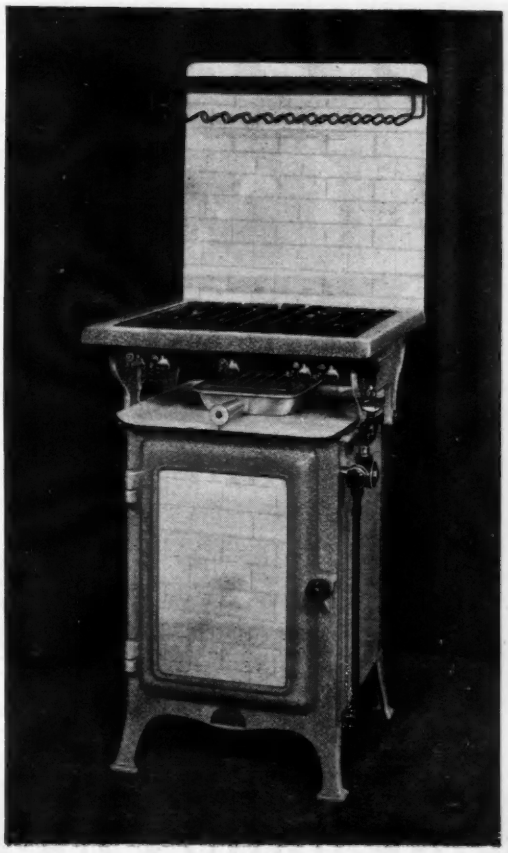

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